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Research Article

Association between hypertensive disorders and COVID- 19 during pregnancy

Hashim Fares Mohamed[1], Ayman Nady Abd Elmaged [1], Hassan Hamdy Ibrahim[2] and Reham Elkhateeb [1]

[1] Department of Obstetrics and Gynaecology, Faculty of Medicine, Minia University, Minia, Egypt
[2] Department of Obstetrics and Gynaecology, Mattay General Hospital, Minia, Egypt

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Abstract

Background: Due to the physiological and anatomical changes that occur during pregnancy and the rapid global spread of COVID-19, pregnant women and their foetuses are a high-risk population during infectious disease epidemics. The aim is to investigate the idea that COVID-19 infection raises the risk of perinatal hypertensive disorders. **Methods:** This combined retrospective and prospective cohort study was conducted at maternity Hospital, Minia University and isolation Hospitals which have a universal COVID-19 testing policy and admission to labor and delivery; Minia Insurance Hospital and Mallawi Specialized Hospital. **Result:** we enrolled 373 pregnant women after consideration of inclusion and exclusion criteria; 115 cases were enrolled in group of positive COVID-19 infection and 230 cases included in group of non COVID-19 infection. 36 cases at group of positive COVID-19 had preeclampsia with incidence 31.3%, while 42 cases of non COVID-19 group had PE with incidence 18.3%. This study revealed that high incidence of ICU admission; incidence at group of PE with COVID-19 was 72.2% while at PE without COVID- 19 was 45.2%, so median duration of ICU admission in PE WITH COVID-19 infection was 8 with IQR (5.8-9) and the median at group of PE without COVID-19 was 5 with IQR (3-7). This study showed that adverse perinatal outcome; maternal and fetal complications with high incidence of maternal mortality 41.6% at group of PE with COVID-19 infection, and 42.8% at group of PE without COVID-19 infection. **Conclusion:** Development of preeclampsia in COVID-19 patients worsen maternal and fetal outcome. It increases the need for oxygen therapy, increasing need for antihypertensive treatment and invasive ventilation support.

Keywords: hypertensive disorders; COVID-19 19; pregnancy; fetal outcomes

Introduction

Towards the end of 2019, Wuhan, China reported the first case of Novel Corona Virus (SARS-COV-2), a new strain of the corona virus that causes COVID-19. The common cold, Middle East Respiratory Syndrome (MERS-COV), and Severe Acute Respiratory Syndrome (SARS-COV) are all upper respiratory tract illnesses caused by mild to moderate corona virus strains [(1)]. This novel strain, known as SARS-COV-2, has been identified from respiratory droplets, secretions, feces, and fomites and is pathogenic to humans. When an infected individual coughs or sneezes, respiratory droplets come into touch with the mucous membranes of the respiratory tract, which is how this virus is spread by close person-to-person contact. Additionally, fecal-oral transmission has been documented. The usual time for a virus to incubate is 4 days, but it can take up to 14 days [(1)].

Pregnant women and their unborn children are at high risk for infection during infectious disease outbreaks because of the rapid global spread of COVID-19. Physiological and anatomical changes, such as an increase in the transverse diameter of the thoracic cage and an elevated level of the diaphragm, also make pregnant women more susceptible to infection [(2)].

Clinical signs similar to preeclampsia, such as hypertension, proteinuria, and increased liver enzymes, can result after severe SARS-COV-2 infection., thrombocytopenia, hypercoagulability, renal failure, due to endothelial damage, arteriopathy and consideration of SARS-COV-2 is pro- inflammatory status leading to impaired maternal vascular perfusion so, preeclampsia like syndrome may developed that's accelerate maternal morbidity, mortality and worsen perinatal outcomes[(3)]. Many studies have shown that preeclampsia like syndrome developed at severe SARS-COV-2 infection that's resolved after pneumonia improvement, but asymptomatic patients still risky for developing preeclampsia[(4)]. Finally studying how management of pregnant women with COVID-19 in patients with hypertensive disorder with their pregnancies and those preeclampsia like clinical features admitted at hospitals, according to severity of cases using oxygen flow to maintain saturation more than 94%, I.V fluids to maintain hydration, antibiotics, steroids, prophylactic LMWH after venous thromboembolism assessment, antiviral medications and antihypertensive medications Additionally, data on pregnancy status, delivery method, and maternal and fetal outcomes must be included in surveillance systems for COVID-19 subjects who are pregnant [(5).]

Methods

This was combined retrospective and prospective cohort study was conducted at maternity Hospital, Minia University and isolation Hospitals which have a universal COVID-19 testing policy and admission to labor and delivery; Minia Insurance Hospital and Mallawi Specialized hospital. Study was conducted during the duration from 1st April 2020, to 31 October 2021, all cases of acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection during pregnancy that tested positive were compared 1:1 with randomly chosen controls that tested negative for SARS-CoV-2. Standard diagnostic criteria were used to identify hypertensive diseases. We investigated the relationship between COVID-19 and preeclampsia using small cluster sizes.

Inclusion Criteria for study group:

Cases positive for COVID-19 19 confirmed by PCR, Data required for analysis is available, Cases develop hypertension during COVID-19 19 infection (study group), Cases admitted to Maternity hospital Minia University with hypertension COVID-19 negative' (control group).

Exclusion Criteria for groups:

Cases with suspected COVID-19 that weren't confirmed by laboratory tests and patient records were unavailable.

Data collection:

Patients had thorough history-taking, physical examinations, and laboratory tests, including nasopharyngeal reverse transcription polymerase chain reaction (PCR) confirmation and complete blood counts (CBC), C Reactive protein (CRP), markers of coagulopathy (D-Dimer), and serum ferritin, liver and renal function tests Radiological investigations; CT chest showed Ground glass opacities are the most common finding in COVID-19 infections.

Statistical Analysis:

Using Microsoft Excel software, data gathered throughout time, basic clinical examinations, laboratory investigations, and outcome measures were coded, tabulated, and analyzed. The Statistical Package for the Social Sciences (SPSS software version 25.0) programme was then used to input the data and perform analysis.

Results

The incidence of preeclampsia in COVID-19 patients was 31.3%, and incidence of preeclampsia in control group was18.3%. (Figure 1, 2). M.A.P at group of PE with COVID-19 ranged (93- 123) and the mean was 110±7. In PE without COVID-19 M.A.P ranged (99-118) and the mean was 105.7±4.9. There was statistically significant difference between two groups (p value = 0.002). (Table 1)

As regard the severity in the COVID-19 group 8(22.2%) had mild PE and 28(77.8%) cases had severe PE. While PE without COVID-19 group 24(57.1%) cases had mild PE and 18(42.9%) cases has severe PE. There was statistically significant difference between two groups (p value = 0.002). (Table 2)

About 63.9% of cases of preeclampsia with COVID- 19 were complicated by ARDS. Also, there was statistically significant difference in severity of preeclampsia; (77.8%) of cases of preeclampsia with COVID-19 were severe, while incidence of severity of preeclampsia in cases without COVID-19 was (42.9%). (Table 3)

A fetal and neonatal complication there was no statistically significant difference between both groups as regard IUFD, IUGR RD and early neonatal death, but there was statistically significant difference as regard neonates needed incubation. (Table 4)

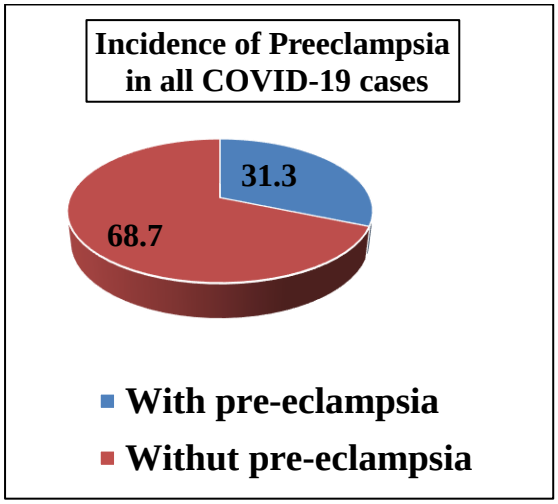

Fig. (1): Incidence of Preeclampsia in all COVID-19 cases

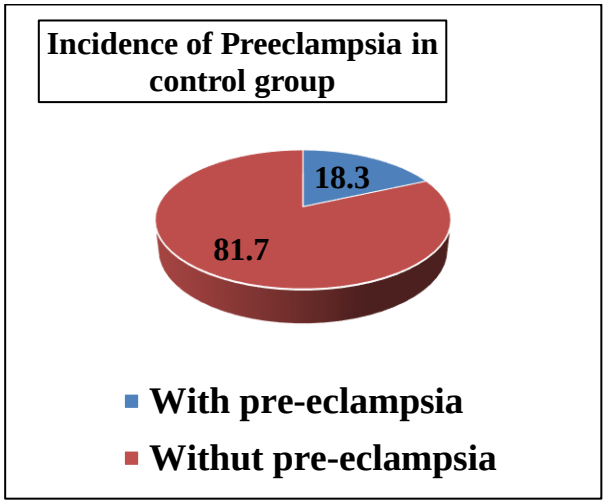

Fig. (2): Incidence of Preeclampsia in control group

Table 1: Comparison of demographic data between the two groups

		Preeclampsia		P value
		COVID	Non-COVID	
		N=36	N=42	
Age	*Range* *Mean ± SD*	(18-40) 29.4±6.4	(17-45) 28.7±7.3	0.623
BMI	*Range* *Mean ± SD*	(22-31) 26±2.3	(24-33) 27.9±2.5	**0.001***
M.A.P	*Range* *Mean ± SD*	(93-123) 110±7	(99-118) 105.7±4.9	**0.002***
Duration of marriage	*Median* *IQR*	10 (2.3-13.8)	5 (1.8-10.5)	0.100
Residence	*Rural* *Urban*	22(61.1%) 14(38.9%)	24(57.1%) 18(42.9%)	0.722
Parity	*Median* *IQR*	2 (0-3)	1 (0-3)	0.297

Table 2: Comparison of severity of PE between the two groups

		Preeclampsia		P value
		COVID	Non-COVID	
		N=36	N=42	
Severity of PE	*Mild* *Severe*	8(22.2%) 28(77.8%)	24(57.1%) 18(42.9%)	**0.002***

Table 3: Comparison of maternal complications between the two groups

		Preeclampsia		P value
		COVID	Non-COVID	
		N=36	N=42	
ARDS	*No* *Yes*	13(36.1%) 23(63.9%)	42(100%) 0(0%)	**<0.001***
Severe PE,E	*No* *Yes*	8(22.2%) 28(77.8%)	24(57.1%) 18(42.9%)	**0.002***
HELLP	*No* *Yes*	24(66.7%) 12(33.3%)	28(66.7%) 14(33.3%)	1
RENAL	*No* *Yes*	31(86.1%) 5(13.9%)	35(83.3%) 7(16.7%)	0.735
PUL EMB	*No* *Yes*	34(94.4%) 2(5.6%)	39(92.9%) 3(7.1%)	0.775
PP HG	*No* *Yes*	33(91.7%) 3(8.3%)	42(100%) 0(0%)	0.056
Cerebral Hge	*No* *Yes*	36(100%) 0(0%)	40(95.2%) 2(4.8%)	0.497
Impaired liver function	*No* *Yes*	19(52.8%) 17(47.2%)	28(66.7%) 14(33.3%)	0.211
Maternal mortality	*No* *Yes*	21(58.3%) 15(41.6%)	24(57.1%) 18(42.8%)	0.916

Table 4: Comparison of fetal complications between the two groups

		Preeclampsia		P value
		COVID	Non-COVID	
		N=36	N=42	
IUFD	*No* *Yes*	31(86.1%) 5(13.9%)	37(88.1%) 5(11.9%)	0.794
IUGR	*No* *Yes*	35(97.2%) 1(2.8%)	38(90.5%) 4(9.5%)	0.225
E N D	*No* *Yes*	33(91.7%) 3(8.3%)	42(100%) 0(0%)	0.056
RD	*No* *Yes*	12(33.3%) 24(66.7%)	23(54.8%) 19(45.2%)	0.058
INCUB	*No* *Yes*	11(30.6%) 25(69.4%)	23(54.8%) 19(45.2%)	**0.032***
PTL	*No* *Yes*	20(55.6%) 16(44.4%)	23(54.8%) 19(45.2%)	0.944
L B Wt	*No* *Yes*	27(75%) 9(25%)	34(81%) 8(19%)	0.526

Discussion

HDP is related with early COVID-19 infections, indicating that COVID-19 infection may change pregnancy physiology and raise the chance of HDP development over time. [6].

This retrospective cohort study was carried in maternity Hospital, Minia University and isolation Hospitals during the duration from 1st April 2020, to 31 October 2021. This study was conducted to test the hypothesis that COVID-19 infection is associated with an increased risk of hypertensive disorders with pregnancy.
This study comprised Cases develop hypertension during COVID-19 19 infection and cases admitted to Maternity hospital Minia University with hypertension 'COVID-19 19 negative.

This study showed that there was a significant difference as regard BMI between PE with COVID-19 patients and PE without COVID- 19 patients as regard BMI. BMI mean was 26 ±2.3, 27.9±2.5 at both groups respectively. Papageorghiou et al.,[7] results showed that median BMI of the PE patients with COVID- 19 was 28.5+8.5 while it was 27.2+6.0 for the PE group who were non-COVID-19 diagnosed.

This study showed that was significant difference as regard systolic blood pressure "SBP" at both groups; mean of SBP was 150.9±11.6 at group of PE with COVID-19 patients and group of PE without COVID-19 was 143.6±8.4, also showed that there was significant difference as regard MAP between PE with COVID-19 patients; mean of MAP was 110±7 and mean of BMI of PE without COVID-19 patients was 105.7±4.9, Li et al., 2020[8] found that hypertension was an independent risk factor for severe COVID-19.

As regard comorbidities and risk factors, cardiac disease in patients with PE with COVID-19 was 11.1% with no cardiac patients at group of PE without COVID-19 recorded. Ya-dong Gao,[9] research that showed Numerous risk factors, including hypertension, diabetes, obesity, chronic lung, heart, liver, and kidney diseases, tumours, clinically apparent immune deficiencies, local immune deficiencies, including early type I interferon secretion capacity, and pregnancy, have been linked to the progression of COVID-19 into a severe and critical stage.

This study showed statistically significant difference as regard severity of PE. Incidence of severe PE in COVID-19 patients 77.8%, while was 42.9% for group for group of PE without COVID-19 patients. (AJOG, 2021). [10]

This study showed that increased rate incidence of maternal ICU duration 77.8% at group of PE with COVID-19, so increased rate incidence of maternal complications to reach 63.9% of cases who developed acute respiratory distress syndrome while no cases, developed ARDS at PE without COVID-19 group.

As regard fetal complications study showed statistically significant difference for neonatal incubation, incidence of neonates needed incubation was 69.4% for group of PE with COVID-19, while incidence was 45.2% for group of PE without COVID-19. There was no statistically significant difference as regard IUFD, IUGR, early neonatal death and respiratory distress syndrome at both groups. Papageorghiou et al., 2021 [7]

Strength and limitation points:

All cases included at this study were confirmed diagnosis of COVID-19 by PCR, including pregnant patients from any time of pregnancy early to late pregnancy duration. Our study had expected limitations; restricted numbers of hospitals that had a universal COVID-19 testing policy and admission to labour and delivery. Not all patients records admitted at isolation hospitals were available. Difficulties to recall with patients after improvement and hospital discharge.

Conclusion

Development of preeclampsia in COVID-19 patients worsen maternal and fetal outcome. It increases the need for oxygen therapy, increasing need for antihypertensive treatment and invasive ventilation support.

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