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Feto Maternal Outcome of Infected Pregnant Women with COVID-19 in Basra

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Abstract

Background: The corona virus disease 2019 (COVID-19) is a pandemic health disaster leads to high morbidity and mortality rates all over the world. The literatures concerning effect of COVID-19 disease on pregnancy outcomes are limited.

Aim of study :

To evaluate the effect of COVID-19 on pregnancy during the antenatal, intrapartum & postpartum maternal and fetal-neonatal outcome among infected women .

Patients and methods:

A prospective observational study done in Basra Teaching Hospital in Basra government/ south of Iraq during the period from 1st of March, 2020 to 28th of February, 2021 on sample of one hundred pregnant women infected by COVID-19.The data were collected by direct interview & filling a previously prepared questionnaire. The diagnosis of COVID-19 disease in pregnancy and severity categorization was done by physician according to Iraqi Ministry of Health guidelines for diagnosis**.**

Results: The COVID-19 severity in pregnant women was classified into; mild (60%), moderate (26%) and severe (14%). 68% of participants had good final outcomes & 32% of them had poor outcomes. 66% of fetuses of participants had good final outcomes & 34% of fetuses had poor outcomes.

Conclusions: The COVID-19 in pregnancy leads to significant poor maternal & fetal outcomes.

Keywords: COVID-19 , Pregnancy, Maternal outcomes, Fetal outcomes.

Introduction

WHO registered more than 188 million confirmed deaths caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) on 15 July 2021 ; & more than 4 million confirmed deaths caused by corona virus disease 2019 (COVID-19) worldwide [1]. Pregnant ladies with COVID-19 may be at higher risk of complications [1, 3]. Physiological immune & respiratory system changes during pregnancy significantly increase the risk of more severe illness from

respiratory infections [4]. In addition, increased oxygen consumption & mucosal edema of the respiratory system during pregnancywill increase the susceptibility to severe respiratory pathogens affection[5]. During the 2009 H1N1 influenza A virus pandemic, pregnancy increased the risk of hospitalization for H1N1 influenza infections almost 4-folds[6]. In 2003 during the SARS-CoV outbreak,& and 2012 during theMiddle Eastern Respiratory Syndrome outbreaks, reports showed that pregnant ladies with these corona virus infections experienced poor maternal and fetal outcomes [7]. Still,there is limited data regarding pregnancy outcomes and the ongoing COVID-19 pandemic [8]; the available reviews are often based on case studies and case series, which may be inherently biased [9].

Physiological changes in pregnancy with COVID-19 disease

A. Immunological Response :COVID-19 is a capsulated single-stranded RNA virus [10]. Like other viruses, the response to COVID-19, relies on a working immune system [10]. The immune system adapts during pregnancy to allow for the growth of a semiallogenic fetus [11], resulting in an altered immune response to infections during pregnancy [12],which may in tern result in different response to infection than in non pregnant ladies.

B. Respiratory Response : During pregnancy, respiratory function ultered due to the anatomical changes in the thorasic cage shape and the elevation of the diaphragm due to the diaphragmatic splinting by the gravid uterus will cause a 30–40% increase in tidal volume, decrease in chest volume causing reduction in the functional residual capacity, end-expiratory volumes, and residual volumes since early in pregnancy ,this will reduce the total lung capacity causing inability to clear secretions which in turn make the pregnant ladies at risk to severe respiratory problem if get respiratory infection as compared to non pregnant ladies [13].

C. Coagulation Response : During pregnancy, there are elevated levels of circulating fibrinolytic & coagulation factors, such as plasmin, Those factors may play a role in the pathogenesis of SARS-CoV-2 infection[14]- [15]. Pregnant women are at higher risk of thromboembolic events with associated morbidity& mortality[16]. For that reason, pregnant ladies with COVID-19 may have additional or synergistic risk factors for thrombosis[17-18].

D. Endothelial Cell Function: The main cause of mortality in COVID-19 is the acute respiratory distress syndrome (ARDS) [19]. There are suggestions that a dysfunction in the pulmonary endothelial cels has a significant role in the onset and progression of ARDS [20].Normally, endothelial cells are surrounded by mural cells (pericytes) which can limit the inflammation response to infection by decreasing the entry of immune cells & preventing the coagulation process through releasing of anticoagulant factors. In ARDS, this mechanism will be inhibited because of damage of this endothelial barrier , resulting in tissue edema, more inflammation, and hypercoagulability. Risk factors for COVID-19 include: (advanced age, overweight, cardiovascular disease& diabetes mellitus) are associated with some alteration in endothelial cell function[20-21]. Women with preeclampsia have an inadequate decrease in vascular resistance insecond half of pregnancy and associated endothelial cell dysfunction [22]. The theory of the endothelial cell dysfunction in the development and progression of COVID-19,put these women at particular risk, if get infected [23]. Recent studies showed higher rates of preeclampsia in pregnant women hospitalized with COVID-19 [23].

E. Vertical Transmission & Placental Roles : These mechanisms are uncertain yet**.**

Aim of study: To evaluate the effect of COVID-19 on pregnancy during antepartum ,intrapartum &postpartum maternal and fetal-neonatal final outcome in the infected women..

Patients & Methods

Patients :

The current study was a prospective observational study done in Basra Teaching Hospital in Basra government / south of Iraq for one year duration from 1st of March, 2020 to 28th of February, 2021 on sample of 100 pregnant women with COVID-19 as the study population after taking the agreement of minister of health, verbal informed consent of these women in addition to confidentiality of data was taken in consideration. The inclusion criteria were pregnant women with positive reverse transcriptase-polymerase chain reaction (rt-PCR) test admitted in obstetric wards or labor room of the hospital. On other hand, negative rt-PCR, lost to follow up, missing or incomplete data and pregnant women refused to participate in the study were the exclusion criteria.

Methods :

The data was collected prospectively from a direct interview of pregnant women infected by COVID-19 and filled in a previously prepared questionnaire. Each women included in this study was assessed by taking full history including general characteristics of women understudy (age, gravidity, parity, miscarriage and gestational age), past-medical history, medical diseases, past-surgical history and history of previous COVID-19 infection, the presenting symptom(s) (asymptomatic or symptomatic with fever, cough, sore throat, shortness of breath, headache, loss of smell, loss of taste, fatigue, diarrhea and others), COVID-19 disease severity (mild, moderate and severe), outcome of affected pregnant women understudy ,their status, miscarriage, mode of delivery, postpartum hemorrhage, hysterectomy and final outcome) and their births outcomes (status, gender, birth weight, apgar score at 1 minute and at 5 minutes, neonatal intensive care unit (NICU) admission, neonatal death and final outcome). The diagnosis of COVID-19 disease was done by physician through history, clinical examination and positive rt-PCR according to Iraqi Ministry of Health guidelines for diagnosis. The severity of COVID-19 disease was recorded by physician in regard to Iraqi Ministry of Health guidelines for diagnosis as mild cases were treated as outpatient and not need for admission to intensive care unit, while moderate need admission to intensive care unit and may need high flow oxygenation and sever cases were in need for aggressive treatment and mechanical ventilation. The studied women were followed up for maternal and a fetal outcome was done by phone calling with pregnant women until peurperium completed. Follow up was done in ante-and postpartum period of women understudy for any complication .All investigations were done in Laboratory unit of the hospital. The maternal and neonatal outcomes were assessed by Obstetrician(as well as by physician) and by Pediatrician accordingly .

Statistical analysis:

Statistical Package for Social Sciences (SPSS) version 22 was used. Descriptive statistics presented as (mean ± standard deviation) and frequencies as percentages. Multiple contingency tables conducted and appropriate statistical tests were performed; Chi-square and Fishers exact tests were used for categorical variables. In all statistical analysis, level of significance (p value) set at ≤ 0.05

Results :

100 pregnant women with COVID-19 presented with mean age of 29.2±6.2 years and range of (16-42 years); 6% of participants were of age group <20 years, 88% of them were in age group 20-39 years and 6% of them were ≥ 40 years old. The gravidity of women understudy was distributed as followings; primigravida (28%), 2-4 gravida (44%) and gravida of 5 and more (28%). The their parity was distributed as followings; nullipara (28%), primipara (12%), 2-4 para (50%) and para 5 and more (10%). The miscarriage history was positive in 20% of women . Mean gestational age of those women at presentation was 33.8±6.9 weeks; 16% of them had infected at gestational age of less than28 weeks abortion), 42% of them had infected at 28-36 weeks of gestation and 42% of them had infected at gestation of 37 weeks and more. (***Table 1***)

Table 1: General characteristics of pregnant women with COVID-19 disease.

Variable	N	%
Age Mean ±SD (29.2±6.2 Years)		
<20 Years	**6**	**6.0**
20-39 Years	**8**	**88.0**
≥40 Years	**6**	**6.0**
Gravidity		
Primigravida	**2**	**28.0**
2-4 Gravida	**4**	**44.0**
≥5 Gravida	**2**	**28.0**
Parity		
Nullipara	**2**	**28.0**
Primipara	**1**	**12.0**
2-4 Para	**5**	**50.0**
≥5 Para	**1**	**10.0**
History Of Miscarriage	**2**	**20.0**
Gestational Age Mean ±SD (33.8±6.9 Weeks)		
Less Than 28 Weeks (Abortion)	**1**	**16.0**
28-36 Weeks	**4**	**42.0**
≥37 Weeks	**4**	**42.0**

Positive past medical history of women understudy was in 24% of them; commonly hypertension (75%), followed by; thyroid diseases (16.7% and DM with HT (8.3%). Past surgical history was positive in 22% of cases, while history of previous COVID-19 infection was positive in 8% of them. (***Table 2***)

Table 2: Clinical of pregnant women with COVID-19 disease history.

Variable	No.	%
Positive Past	**24**	**24.0**
Ht	**18**	**75.0**
Thyroid Diseases	**4**	**16.7**
Dm & Ht	**2**	**8.3**
Positive Past	**22**	**22.0**
Positive History Of Previous COVID-19 Infection	**8**	**8.0**

The asymptomatic clinical presentation was present in 20% of pregnant women with COVID-19 disease, while common clinical features of COVID-19 disease in pregnant women were cough (72%), fever (54%), shortness of breath (44%), fatigue (40%), others like abdominal pain and thyroid diseases symptoms (36%), headache (28%), sore throat (22%), diarrhea (12%), loss of smell (6%) and loss of taste (2%). (***Table 3***)

Table 3: Clinical features of pregnant women with COVID-19 disease.

Variable	No.	%
Asymptomatic	**20**	**20.0**
Fever	**54**	**54.0**
Cough	**72**	**72.0**
Sore Throat	**22**	**22.0**
Shortness Of Breath	**44**	**44.0**
Headache	**28**	**28.0**
Loss Of Smell	**6**	**6.0**
Loss Of Taste	**2**	**2.0**
Fatigue	**40**	**40.0**
Diarrhea	**12**	**12.0**
Others	**36**	**36.0**
Total	**100**	**100.0**

The COVID-19 disease severity in pregnant women was classified into; mild (60%), moderate (26%) and severe (14%). (***Table 4***)

Table 4: Severity COVID-19 disease.

Variable	No.	%
COVID-19 Disease Severity		
Mild	**60**	**60.0**
Moderate	**26**	**26.0**
Severe	**14**	**14.0**
Total	**100**	**100.0**

12 (12%) of infected women were aborted, 62 (62%) were delivered, while 26% of them were discharged. Alive status was reported in 92(92%) of women understudy, while 8% of them were died. 32 (36.6) have normal vaginal delivery,56 (63.6%|) delivered by cesarean section. Hysterectomy was done for two participants, while postpartum hemorrhage was present in 16 (16%) of them. Final maternal outcome revealed that 68% of participants had good outcome and 32% of them had poor outcome. ***(Table 5).***

Table 5: Maternal outcomes of pregnant women with COVID-19 disease.

Variable	No.	%
Maternal Outcome		
Miscarriage	**12**	**12.,0**
Delivered	**62**	**62.0**
Discharged	**26**	**26.0**
Maternal Status		
Alive	**92**	**92.0**
Dead	**8**	**8.0**
Mode Of Delivery		
Vaginal Delivery	**32**	**36.4**
Cesarean Section	**56**	**63.6**
Hysterectomy	**2**	**2.0**
Postpartum Hemorrhage	**16**	**16.0**
Final Maternal Outcome		
Good	**68**	**68.0**
Poor	**32**	**32.0**

The stillbirth was reported in 8 (9.1%) births of infected women Male gender was more than female (59.1% vs. 40.9%). Mean birth weight newborns was (2.8 Kg); which was low in

13.6% of them. The activity of newborn assessed by apgar score at 1,5 minute was low in 22.5%,15% of them respectively. .NICU admission was reported for 20% of newborns. Neonatal death was recorded in (10%) .. Final fetal outcome revealed that 66% of newborns of women understudy had good outcome and 34% of fetuses had poor outcome. (***Table 6***).The poor outcome criteria included hospital stay for two weeks duration or more, death or expectance of permanent damage or loss.(Table 6):

Table 6 : Fetal Outcomes Of Pregnant Women With COVID-19 Disease.

Variable	N0.	%
Fetal Status		
Stillbirth	**8**	**9,1**
Alive Birth	**80**	**90.9**
Fetal Gender		
Male	**52**	**59.1**
Female	**36**	**40.9**
Birth Weight Mean ± SD(2.8±0.5 Kg)		
Low	**12**	**13.5**
Apgar Score At 1 Min. Mean ± SD (8.4±2.3) .		
Low	**18**	**22.5**
Apgar Score At 5 Min. Mean± SD (9± 1.7).		
Low	**12**	**15.0**
NICU Admission	**16**	**20,0**
Neonatal Death	**8**	**10.0**
Final Fetal Outcome		
Good	**66**	**66.0**
Poor	**34**	**34.0**

Non significant differences in the prognosis were observed among women understudy regarding age (p=0.22). While both gravida (2-4)group and multyparity (2-4)group were found to be significantly association with poor maternal outcome (p=0.03) , (p=0.02) respectively. A highly significant association was observed between poor maternal outcome and positive history of miscarriage (p<0.001)and Preterm pregnancy (less than 37 weeks)at presentation of women with COVID-19 infection (p<0.001). (***Table 7***).poor maternal outcome criteria included hospitalization for 2 weeks or more, fetal loss, permanent damage like hysterectomy or death.

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Table 7: Distribution of general characteristics according to final maternal outcome.

Variable	Final Maternal Outcome				P
	Good		Poor		
	No.	%	No.	%	
					0.22*^{NS}
Age	4	5.9	2	6.3	
20-39 Years	58	85.3	30	93.8	
≥40 Years	6	8.8	0	-	
Gravidity					0.03**^{S}
Primigravida	22	32.4	6	18.8	
2-4 Gravida	24	35.3	20	62.5	
≥5 Gravida	22	32.4	6	18.8	
Parity					0.02*^{S}
Nullipara	22	32.4	6	18.8	
Primipara	8	11.8	4	12.5	
2-4 Para	28	41.2	22	68.8	
≥5 Para	10	14.7	0	-	
Previous	6	8.8	14	43.8	<0.001*
Gestational Age At Participation					<0.001*
Less Than 28	4	5.9	12	37.5	
29-36 Weeks	24	35.3	18	56.3	
≥37 Weeks	40	58.8	2	6.3	

***Fishers exact test, **Chi square test, NS=Not significant, S=Significant.**

A significant association was observed between HT history of and poor maternal outcome (p=0.05). While no other past medical (p=0.02). nor surgical history or even history of previous COVID-19 infection were significantly associated with the final maternal prognosis of the disease (p=0.02), (p=0.11),(p=0.25) respectively. (***Table 8***)

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Table 8: Distribution Of Clinical History According To Final Maternal Outcome.

Variable	Final Maternal Outcome				P
	Good		Poor		
	No.	%	No.	%	
Positive Past Medical Diseasesof					**0.05**^{S}**
HT	**8**	**57.1**	**10**	**100.0**	
Thyroid Diseases	**4**	**28.6**	**0**	**-**	
DM & HT	**2**	**14.3**	**0**	**-**	
Positivepast Surgical	**18**	**26.5**	**4**	**12.5**	
Positive History Of Previouscovid -19 Infection	**4**	**5.9**	**4**	**12.5**	

**Chi-square test, Fishers exact test, S=Significant, NS=Not significant*

Asymptomatic presentation was not significantly affect the maternal outcome (p=0.19), like cough (p=0.14), sore throat (p=0.59), shortness of breath (p=0.09) and loss of smell (p=0.06). The significant clinical features of COVID-19 disease which found to be associated with poor maternal outcomes were fever (p=0.04), headache (p<0.001), loss of taste (p=0.03), fatigue (p=0.02), diarrhea (p=0.006) and others (p<0.001). (***Table 9***)

Table 9: Distribution of clinical features according to final maternal outcome.

Variable	Final Maternal Outcome				P
	Good		Poor		
	No.	%	No.	%	
Asymptomatic	**16**	**23.5**	**4**	**12.5**	**0.19*^{NS}**
Fever	**32**	**47.1**	**22**	**68.8**	**0.04*^{S}**
Cough	**52**	**76.5**	**20**	**62.5**	**0.14*^{NS}**
Sore Throat	**16**	**23.5**	**6**	**18.8**	**0.59*^{NS}**
Shortness Of Breath	**26**	**38.2**	**18**	**56.3**	**0.09*^{NS}**
Headache	**10**	**14.7**	**18**	**56.3**	**<0.001*^{S}**
Loss Of Smell	**2**	**2.9**	**4**	**12.5**	**0.06*^{NS}**
Loss Of Taste	**0**	**-**	**2**	**6.3**	**0.03**^{S}**
Fatigue	**22**	**32.4**	**18**	**56.3**	**0.02*^{S}**
Diarrhea	**4**	**5.9**	**8**	**25.0**	**0.006**^{S}**
Others	**12**	**17.6**	**24**	**75.0**	**<0.001**^{S}**

**Chi-square test, Fishers exact test, S=Significant, NS=Not significant*.

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There was a highly significant association between severe COVID-19 disease in pregnancy and poor maternal outcome (p<0.001). (***Table 10***)

Table 10: Distribution of COVID-19 disease severity according to final maternal outcome.

Variable	Final Maternal Outcome				P
	Good		Poor		
	No.	%	No.	%	
Disease Severity					**<0.001*S**
Mild	50	73.5	10	31.3	
Moderate	12	17.6	14	43.8	
Severe	6	8.8	8	25.0	

**Chi-square test, S=Significant.*

Age of moms was not significantly alter the prognosis of their fetuses (p=0.8). Still poor fetal-neonatal outcome significantly more among gravid 92-4) group and para (2-4) group of moms. (p=0.02 and p=0.003, respectively). A significant association was observed between positive history of miscarriage and poor fetal outcome (p=0.006). Earlier gestational age at COVID-19 infection is significantly associated with poor fetal outcome (p<0.001). (***Table 11***)

Table 11: Distribution of general characteristics according to final fetal outcome.

Variable	Final Fetal Outcome				P
	Good		Poor		
	No.	%	N	%	
Age					**0.8 *NS**
<20 Years	3	4.5	3	8.8	
20-29 Years	32	48.5	16	47.	
30-39 Years	27	40.9	13	38.	
≥40 Years	4	6.1	2	5.9	
Gravidity					**0.02**S**
Primigravida	23	34.8	5	14.7	
2-4 Gravida	23	34.8	21	61.8	
≥5 Gravida	20	30.3	8	23.5	
Parity					**0.003**S**
Nulliparous	23	34.8	5	14.	
1-3 Para	25	37.9	25	73.	
≥4 Para	18	27.3	4	11.	
Previous	8	12.1	12	35.	**0.006**S**
Gestational Age					**<0.001**S**
<28 Weeks	2	3.0	10	29.	
28-36 Weeks	25	37.9	21	61.	
≥37 Weeks	39	59.1	3	8.8	

**Fishers exact test, **Chi square test, NS=Not significant, S=Significant.*

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No significant relation registered between the fetal outcome and moms past medical history (p=0.56), past surgical history (p=0.2) and history of previous COVID-19 infection (p=0.57) apart from significant association observed among hypertensive moms (p=0.03). (***Table 12***).

Table 12: Distribution of clinical history according to final fetal outcome.

Variable	Final Fetal Outcome				P
	Good		Poor		
	No.	%	No.	%	
Positivepast Medical Diseases					**0.03**^{S}**
HT	**13**	**76.5**	**5**	**71.4**	
Thyroid Diseases	**4**	**23.5**	**0**	**-**	
DM & HT	**0**	**-**	**2**	**28.6**	
Positive Past	**17**	**25.8**	**5**	**14.7**	**0.2*^{NS}**
Positive History Of Previous COVID-19 Infection	**6**	**9.1**	**2**	**5.9**	**0.57**^{NS}**

**Chi-square test, Fishers exact test, S=Significant, NS=Not significant.*

No significant differences in the fetal- neonatal outcome were observed regarding asymptomatic presentation (p=0.13), fever (p=0.13), cough (p=0.24), sore throat (p=0.79), shortness of breath (p=0.65), headache (p=0.24) and diarrhea (p=0.55). The significant clinical features of COVID-19 disease which are associated with poor fetal-neonatal outcome were loss of smell (p<0.001), loss of taste (p=0.04), fatigue (p=0.001) and others (p<0.001). (***Table 13***).

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Table 13: Distribution Of Clinical Features According To Final Fetal -Neonatal Outcome

Variable	Final Fetal Outcome				P
	Good		Poor		
	No.	%	No.	%	
Asymptomatic	16	24.2	4	11.8	0.13*NS
Fever	32	48.5	22	64.7	0.13*NS
Cough	50	75.8	22	64.7	0.24*NS
Sore Throat	14	21.2	8	23.5	0.79*NS
Shortness Of	28	42.4	16	47.1	0.65*NS
Headache	16	24.2	12	35.3	0.24*NS
Loss Of Smell	0	-	6	17.6	<0.001**S
Loss Of Taste	0	-	2	5.9	0.04**S
Fatigue	19	28.8	21	61.	0.001*S
Diarrhea	7	10.6	5	14.	0.55**NS
Others	16	24.2	20	58.	<0.001*S

**Chi- square test, Fishers exact test, S=Significant, NS=Not significant*

There was a highly significant association between severe COVID-19 disease in pregnancy (table 14).

Table14: Distribution Of COVID-19 Disease Severity According To Final Fetal Outcome.

Variable	Final Fetal Outcome				P
	Good		Poor		
	No.	%	No.	%	
Disease Severity					<0.001*S
Mild	49	74.2	11	32.4	
Moderate	10	15.2	16	47.1	
Severe	7	10.6	7	20.6	

**Chi-square test, s=significant.*

Discussion

COVID-19 pandemic outbreak had great burden on governmental health care institutes causing health disaster mainly in developing countries. Defective health services regarding the care of pregnant women and fetuses / newborns could lead to poor outcomes specifically in these poor countries [24].In current study, 20% of pregnant women with COVID-19 disease (cases under study) were asymptomatic and 80% of them were presented commonly with cough, fever, shortness of breath and fatigue; while only 50 % of cases were symptomatic in Lassi et al systematic review and meta-analysis study in Australia, and the common clinical symptoms were cough, fever, fatigue and anosmia. The cause may be because the health survice there may offer more testing to detect the virus; .the people also may have more health orientation making their attendance to health centers for search for the infection more active, Our study showed that COVID-19 disease severity in pregnant women was classified into; mild (60%), moderate (26%) and severe (14%) similar to the results of Samadi et al [25]descriptive-analytical cross-sectional study in Iran ,which reported that 79.8% of cases had mild to moderate disease, while 20.2% of them had severe to critical disease. A recent study conducted in Turkey by Sahin et al study reported that laboratory investigations such as C-reactive protein, serum ferritin level, neutrophil to lymphocyte ratio and aspartate aminotransferase are essential in predicting severe COVID-19 disease in pregnant women while in our study mainly depending on long duration of hospitalization(more than 2weeks) the need for high concentration of oxygen for long duration , permanent damage like hysterectomy or baby loss or death. The association between physiological changes in pregnancy and COVID-19 infection lead to predicting of severe respiratory illness. The present study showed that 68% of pregnant women with COVID-19 disease had good outcome and 32% of them had poor outcome. This finding is better than results of Goyal et al prospective observational single-center study in India which found that only 32% of case had good maternal outcomes. Our study reported maternal death in 8% of women. This is close to death rate of (7%) reported by Tekin et al retrospective cohort study infected pregnant in Turkey . In USA, a recent study showed that COVID-19 disease caused 33.3% substantial increase of maternal death. A multi-systematic review study conducted in UK by Calvert et al stated that maternal death rates related to COVID-19 disease was ranged between 8.5-61.5%. Our study found miscarriage occurred in 12% of infected pregnant women . This finding is close to the results of Cavalcante et al [26] review study in Brazil in which 15..3% of pregnant women infected by COVID-19 disease had miscarriage. In current study, 63.6% of cases were delivered by cesarean section and hysterectomy was done for two them. These results were close to results of Debrabandere et al systematic review study in USA which documented that 68.9% of cases were delivered by cesarean section .Mundhra et al stated that morbidly adhered placenta is the common cause of emergency hysterectomy in pregnant women infected by COVID-19 disease. In our study, postpartum hemorrhage was complicating 16% of deliveries among pregnant women with COVID-19 disease; which is higher than results of Taghavi et al case control study in Iran which reported that only 5% of cases were complicated by postpartum hemorrhage. The difference might be attributed to differences in co-morbidities and maternal characteristics between the two studies. The current study showed that 66% of fetuses/newborns of pregnant women with COVID-19 disease had

good outcome vs 34% had poor outcome. These findings are close to Salem et al review study in United Arab Emirates which reported that about one third of fetuses/newborns had poor fetal outcome. Our study revealed that stillbirth was reported in 8 (9.1%) fetuses of women under study which is better than results of Hameed et al study which found that stillbirth is reported in (11.53%) . In our study, male gender was more than female .Abdoli study in Iran reported no obvious influence of COVID-19 disease on sex ratio at birth. We found that mean fetal birth weight of newborns was (2.8 Kg); 13.6% of newborns had low birth weight. These findings are close to results of Wei et al systematic review and meta-analysis study in Canada which found that low birth weight was detected in 15% of pregnant women with COVID-19 disease. Low apgar score at 1 minute (22.5%)and low neonatal apgar score at 5 minute (15%)in our study was higher than results of Karaçam et al systematic review and meta-analysis study in Turkey (4.3%) and (3.6%) respectively. The NICU admission was observed in 20% pregnant women infected by COVID-19 disease. This finding is higher than results of Murphy et al retrospective study in Ireland (16.5%) . Higher NICU admission rate in our study may be related to obstetrical causes other than COVID-19 disease. We registered higher neonatal death rate (10%) than that reported by Hekimoğlu et al retrospective study in Turkey(4.6%). This difference might be attributed to discrepancy in health infrastructure between different countries and accompanying maternal adverse factors. Like in Fallach et al retrospective cohort study in Palestine we found high parity (para 2-4) group of women and miscarriage history were significantly associated with poor maternal outcome. Alsoour study showed earlier gestational age at COVID-19 infection is significantly associated with poor maternal outcome ($p<0.001$). This finding coincides with results of Villar et al cohort study in 18 countries .A significant association between HT history of moms and poor maternal outcome ($p=0.05$) in our study is consistent with results of Vouga et al study in Switzerland . Current study showed that fever, headache, loss of taste, fatigue, diarrhea were significant clinical features of COVID-19 disease associated with poor maternal outcomes. These findings are close to results of Allotey et al systematic review and meta-analysis study in European countries which revealed that fever, headache and diarrhea are predictors of COVID-19 severity in pregnant women. In present study, there was a highly significant association between severe COVID-19 disease in pregnancy and poor maternal outcome ($p<0.001$). This finding is consistent with results of many literatures such as Wang et al study in China and Metz et al study in USA. In current study, a significant association was observed between positive history of miscarriage and poor neonatal out come($p=0.006$);this is similar to results of Priyadharshini et al study in India. We found that earlier gestational age at COVID-19 infection is significantly associated with poor fetal outcome ($p<0.001$) just like the result of Piekos et al study in USA. The co-morbidity history with hypertension in pregnant women infected by COVID-19 disease lead to poor maternal and fetal outcomes these finding similar both in our study and in Sathiy et al study in India. Our study showed that significant clinical features of COVID-19 disease associated with poor fetal outcomes were loss of smell, loss of taste, fatigue which were close to results of Rodríguez-Díaz et al study in Spain. In current study, there was a highly significant association between severity of COVID-19 disease in pregnancy and poor fetal-neonatal outcome ($p<0.001$)in parallel to the results of Dileep et al retrospective cohort study

in United Arab Emirates .Finally it is vital to say that meta analysis is needed to role out accidental finding which may play a role in understanding the disease strategy ,its pathway of spread &its control, susceptible victims, &put guidelines to treat them &prevent their morbidity &mortality. Till that time preventive general measures are the golden roles in minimizing the disease health disaster

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