COVID-19: Maternal deaths in the tertiary health care center

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The maternal mortality rate is increasing due to associated complications of labor, the severity of infection, and co-morbidities. The impact of COVID-19 infection on pregnant women data is insufficient in the literature, so in the present study, we are evaluating the rate of maternal mortality due to COVID-19 infection in McGANN Teaching District Hospital a tertiary health care center.

The objective: to evaluate the rate of maternal mortality due to COVID-19 infection.

Materials and methods. This is a single-center retro-prospective study, which included all maternal mortalities with CO-VID-19 infection admitted to the department of obstetrics and gynecology, McGANN teaching district hospital a tertiary health care center from June 2020 to October 2021. COVID-19 infected 15 pregnant women who died during hospitalization, treatment, labor, and after labor due to various complications. Data were collected from the medical record section and presented in an excel sheet and analyzed using SPSS software.

Results. In the study period, maternal mortality due to COVID-19 infection was found to be more in the less than 30 years age group (73.3 %). Nearly all cases were admitted with complaints of fever (40 %), cough (53.3 %), abdominal pain (13.3 %), and breathlessness (80 %). Out of 15 maternal deaths, most of the cases are found to be primiparous (46.7 %), and the time from delivery to a death varies from 1-14 days. Nearly 66.7 % of cases had a gestational period of fewer than 36 weeks. Pulse rate, respiration rate, inflammatory markers, prothrombin time, liver enzymes, and blood glucose levels were elevated. The total protein hemoglobin and oxygen saturation percentage declined in the cases. The known co-morbidity present in the cases associated with maternal mortality was hypertension (20 %), diabetic mellitus (13.3 %), valvular heart disease (6.7 %), and pre-eclampsia (6.7 %). The most cause of death was acute respiratory distress syndrome (80 %).

Conclusions. In this study the severe infection with co-morbidities showed an increased risk of severe morbidity and mortality.

Keywords: COVID-19, maternal mortality, morbidity, infection.

COVID-19: показники материнської смертності за даними центру третинної медичної допомоги
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Рівень материнської смертності зростає внаслідок ускладнень під час пологів, тяжкого перебігу інфекційних захворювань та наявності супутніх патологій. У літературі недостатньо даних про вплив інфекції COVID-19 на перебіг вагітності, тому дане дослідження аналізує материнську смертність внаслідок COVID-19, яку зафіксовано у McGANN Teaching District Hospital – центрі третинної медичної допомоги.

Мета дослідження: оцінювання рівня материнської смертності внаслідок інфікування COVID-19.

Матеріали та методи. Це дослідження є одноцентровим ретропроспективним. До нього увійшли дані всіх випадків материнської смерті вагітних з інфекцією COVID-19, які були госпіталізовані у відділення акушерства та гінекології McGANN Teaching District Hospital, центру третинної медичної допомоги, з червня 2020 р. до жовтня 2021 р. Проаналізовано 15 випадків материнської смерті у вагітних, які були інфіковані COVID-19, під час госпіталізації, лікування, пологів та у післяпологовий період внаслідок різних ускладнень. Дані були зібрані з медичної документації та представлені у таблиці Excel і проаналізовані за допомогою програмного забезпечення SPSS.

Результати. За даними дослідження, материнська смертність внаслідок COVID-19 була вищою у жінок вікової групи до 30 років (73,3 %). Майже всі пацієнтки госпіталізовані зі скаргами на лихоманку (40 %), кашель (53,3 %), біль у животі (13,3 %), задишку (80 %). З 15 материнських смертей більшість випадків припадає на першороділей (46,7 %), а період від пологів до смерті коливається від 1 до 14 днів.

Майже 66,7 % жінок мали термін вагітності менше 36 тиж. Відзначено підвищення частоти пульсу, частоти дихання, маркерів запалення, протромбінового часу, печінкових ферментів та рівня глюкози у крові. У цих випадках знижувалися рівень загального білкового гемоглобіну і відсоток насичення киснем. Супутніми захворюваннями, наявними у випадках, пов'язаних із материнською смертністю, були гіпертонія (20 %), цукровий діабет (13,3 %), захворювання клапанів серця (6,7 %) і прееклампсія (6,7 %). Найчастішою причиною смерті був гострий респіраторний дистрес-синдром (80 %).

Висновки. У даному дослідженні тяжка інфекція із супутніми захворюваннями продемонструвала підвищений ризик виникнення тяжкої захворюваності та смерті.

Ключові слова: COVID-19, материнська смертність, захворюваність, інфекція.

World health organization (WHO) officially announced that COVID-19 had become a global pandemic on March 11, 2020 [1]. All over the world, people suffered from COVID-19 infection but people with co-morbidity, elderly adults and pregnant females were affected more compared to the healthy general population. COVID-19 infected pregnant women had severe complications such as intensive care unit (ICU) admission, preeclampsia, eclampsia, HELLP syndrome, preterm birth, and low birth rate compared to pregnant women without COVID-19 infection. This may be due to physiological changes in their immune and cardiopulmonary systems during pregnancy; pregnant women are more likely vulnerable to acquiring respiratory infection and pneumonia [2, 3].

It is well known that in pregnant women, the trophoblast will recognize the micro-organism and produce anti-microbial peptides and these molecules fight against pathogens. In COVID-19 infection it is reported that the COVID-19 pathogen gains entry by damaging the placenta further it will suppress the immune response against infection and increase pregnancy complications in women [4, 5].

Initially, studies reported that pregnant women infected with COVID-19 had mild symptoms or asymptotic and the risk of pregnancy complications and mortality is less; however recent studies reported that COVID-19 infected pregnant and postpartum women had an increased risk of severe complications and also lead to death [6–10].

In the present study, we will find out the rate of maternal mortality and the clinical course of maternal mortality cases due to COVID-19 infection in our tertiary care hospital.

MATERIALS AND METHODS

This is a single-center retro-prospective study conducted in our McGANN teaching district hospital a tertiary health care centre from June 2020 to October 2021. A total of 199 COVID-19 positive pregnant women which was confirmed by reverse transcription polymerase chain reaction (RT-PCR)/ rapid antigen test were admitted to OBG critical care unit. Fifteen pregnant women infected with COVID-19 infection died during hospitalization, treatment, labor, and after labor due to various complications.

Data such as demographic, clinical, complete blood count (CBC), Renal function tests (RFT), Liver function tests (LFT), inflammatory markers and Coagulation indicators levels were collected from the medical record section and plotted on an excel sheet and data was analyzed using SPSS software.

RESULTS

From June 2020 to October 2021, 199 pregnant women with COVID -19 positive cases were admitted to Obstetrics and gynecology department and 15 cases died during treatment and labor due to breathing and other clinical complications. The prevalence of maternal mortality due to COVID-19 infection was found to be 7.54 %.

The mean age of the study population was found to be 28.2±4.7 years, 73.3 % of cases come under less than 30 years whereas 26.7 % come under more than 30 years. In our study, the mean gestation period was found to be 31.3±7.9 weeks

Table 1

Demographical and clinical characteristics of cases

N=15	Frequency (%)	Mean	SD	Std. Error
Age (Years)				
> 30 years	73.3	28.2	4.7	1.224
< 30 years	26.7			
Gestation period (weeks)				
> 36weeks	66.7	31.3	7.9	2.0499
< 36 weeks	33.3			
Pulse rate (PR) during admission				
70–90beats/min	40	105.9	23.3	6.008
< 90beats/min	60			
Pulse rate (PR) during delivery				
70–90beats/min	6.7	117.7	20.3	5.241
< 90beats/min	93.3			
Respiration rate (RR) during admission				
15–21 breath/min	26.7	25.7	8.0	2.067
>15 breath/min	6.7			
< 21 breath/min	66.7			
Respiration rate during delivery				
15–21 breath/min	13.3	28.7	9.8	2.54
< 21 breath/min	86.7			
SpO2 during admission (%)				
Normal	6.7	77.9	17.5	4.513
Abnormal	93.3			
Spo2 during delivery (%)				
Normal	6.7	60.5	18.9	4.873
Abnormal	93.3			
Time interval from admission to death in hrs				
> 120 hrs (5 days)	60	151.5	127.1	32.812
<120 hrs (5 days)	40			

and 66.7 % of cases had a gestational period of fewer than 36 weeks and 33.3 % of cases had a full term (more than 36 weeks) of gestation period. Out of 15 maternal deaths, most of the cases are found to be primiparous (46.7 %) followed by G2P1L1 (26.7 %), P1L1 (13.3 %), G4P1L1 (6.7 %) and G4P1L1A2 (6.7 %). Nearly all cases were admitted with complaints of fever (40 %), cough (53.3 %), abdominal pain (13.3 %), and breathlessness (60 %) (Table 1).

In our study population, the pulse rate, respiration rate, inflammatory markers, prothrombin time, liver enzymes, and blood glucose levels were elevated. The total protein hemoglobin and Oxygen saturation percentage declined in the cases (Table 1, 2, 3 and 4).

In our study population, the pulse rate at the time of admission varies from 76–143 beats/min and during labor, the pulse rate further increases and varies from 90–163 beats/min. Nearly 60 % of cases had more than 90 beats/ min during admission and it reaches 93.3 % during labor. Similarly, the respiration rate during admission and labor varies from 14–40 and 15–50 respiration/min. the

Hematological characteristics of cases

N=15	Frequency (%)	Mean	SD	Std. Error
Blood glucose (mg/dL)				
Normal	13.3			
less	6.7	149.0	71.1	18.351
High	80			
Hemoglobin (%)				
12–16gm/dL	46.7	11.3	1.8	0.4739
> 12gm/dL	53.3			
White blood count (cells/cumm)				
4000–11000	33.3	14906.7	6036.7	1558.677
< 11000	66.7			
Platelet count (in Lakh)				
2.25–2.5	13.3			
> 2.25	40	3.4	2.6	0.6656
< 2.5	46.7			
Neutrophils				
< 11.6	100	84.1	7.2	1.8513
Eosinophils				
Abnormal (high)	100	2.9	1.6	0.408
Lymphocytes				
Normal	6.7	12.0	6.1	1.571
Abnormal (High)	93.3			

Data of Renal and Liver Test

N=15	Frequency (%)	Mean	SD	Std. Error
Sodium (mmol/L)				
Normal	86.7	140.3	7.3	1.881
Abnormal (High)	13.3			
Potassium (mmol/L)				
Normal	86.7			
less	6.7	3.8	0.6	0.1594
High	6.7			
Chloride (mmol/L)				
Normal	100	103.9	3.3	0.859
Creatinine (mg/dL)				
Normal	73.3			
less	6.7	0.8	0.5	0.1175
High	20			
Urea (mg/dL)				
Normal	33.3	23.7	14.5	3.7462
Abnormal (High)	66.7			
Uric acid (mg/dL)				
Normal	46.7			
less	33.3	4.7	2.3	0.5894
High	20			
Bilirubin (mg/dL)				
Normal	86.7			
less	6.7	0.6	0.5	0.1165
High	6.7			
Albumin (g/dL)				
Normal	93.3	3.1	0.5	0.1278
less	6.7			
Total Protein				
Normal	40			
less	53.3	5.6	0.7	0.1712
High	6.7			
Alanine transaminase (U/L)				
Normal	40	36.6	19.9	5.134
Abnormal (High)	60			
Aspartate aminotransferase (U/L)				
Normal	20	53.3	26.9	6.943
Abnormal (High)	80			
Alkaline phosphatase (U/L)				
Normal	60	225.7	123.9	32.001
Abnormal (High)	40			

respiration rate was more in 86.7% of cases during admission where as it further elevated in 93.3 % of cases during labor. In 93.3 % of cases the percentage of oxygen saturation (SpO2 was decreased and the mean of oxygen saturation (SpO2) during admission and labor was found to be 77.9±17.5 and 60.5±18.9 % (Table 1).

The mean blood sugar level was found to be 149±71.1 mg/dL and hyperglycemic and hypoglycemic conditions were noted in 80 % (12) and 6.7 % (1) of cases. The percentage of hemoglobin was less than 12 gm/dl in 53.3 % of cases. Leukocytosis, thrombocytosis, thrombocytopenia, neutrophilia, eosinophilia and Lymphocytosis were observed in 66.7 % and 46.7 %, 40 %, 100 %, 100 % and 93.3 % of cases (Table 2).

We also observed that RFT and LFT examination, the abnormal levels of Sodium, potassium, creatinine, urea and uric acid. Bilirubin, ALT, AST, ALP, and total protein were noted in cases (Table 3).

The levels of inflammatory markers such as CRP, LDH and ferritin were elevated at 93.3 %, 100 %, and 80 % of cases respectively. Coagulation indicators such as D-dimer (DD), prothrombin time (PT) and activated partial thromboplastin time (APTT) levels were elevated in 73.3 %, 86.7 % and 60 % of cases (Table 4).

The known co-morbidity present in the cases associated with maternal mortality was hypertension (20 %), diabetic mellitus (13.3 %), valvular heart disease (6.7 %), and preeclampsia (6.7 %). But based on the blood glucose reports

Table 4

Inflammatory markers and coagulation indicators

N=15	Frequency (%)	Mean	SD	Std. Error
C-reactive protein (mg/dl)				
Normal	6.7	80.3	47.4	12.235
Abnormal (High)	93.3			
Lactate dehydrogenase (U/L)				
Abnormal (High)	100	1420.1	522.9	135
D-Dimer (µg/Ml)				
Normal	20	2.5	1.4	0.366
Abnormal (High)	80			
Ferritin (mu g/L)				
Normal	20	403.8	181.8	46.931
Abnormal (High)	80			
Prothrombin Clotting Time (PT) in Sec				
Normal	6.7	13.5	3.7	0.949
less	6.7			
High	86.7			
Activated Partial Thromboplastin Clotting Time (APTT) in Sec				
Normal	40	36.0	5.0	1.298
Abnormal (High)	60			

Table 5

Positive and negative correlations between study parameters

Parameters		Pearson Correlation	p-Value
Positive correlation			
PR	RR	0.688**	0.005
RR	Chloride	0.525*	0.044
WBC	LDH	0.526*	0.044
WBC	D-dimer	0.671**	0.006
LDH	Blood sugar	0.596*	0.019
APTT	Urea	0.598*	0.019
Potassium	Uric acid	0.677**	0.006
Potassium	Bilirubin	0.603*	0.017
Creatinine	Urea	0.681**	0.005
Uric acid	Bilirubin	0.720**	0.002
ALT	AST	0.79**	0
AST	ALP	0.718**	0.003
Albumin	TP	0.764**	0.001
TP	Age	0.737**	0.002
ALP	Neutrophils	0.555*	0.032
Negative correlation			
Hb	Neutrophils	0.557*	0.031
WBC	Ferritin	0.516*	0.049
PT	Blood sugar	0.543*	0.037
APTT	Albumin	0.532*	0.041
ALT	SPO2	0.541*	0.037

in our study, 80% of people had high glycaemic levels, abnormal values of LFT (Liver function test) and RFT (renal function test) with inflammatory markers noted in the maternal blood analysis when they were admitted. Without their knowledge due to COVID-19 infection most of the organ's function was altered and may they also be involved in maternal mortality. Due to severe and acute respiratory syndrome, nearly 80 % of cases ended their life.

Notes: ALP: Alkaline phosphatase, ALT: Alanine transaminase, APTT: Activated Partial Thromboplastin Clotting Time , AST: Aspartate aminotransferase, Hb: Hemoglobin, LDH: Lactate dehydrogenase, PR: Pulse rate, PT: Prothrombin Clotting Time, RR: Respiration rate, SPO2: Oxygen saturation, TP: Total Protein, WBC: White blood count.

In our study, statistically significant positive and negative correlations were observed between study parameters which were presented in table 5.

DISCUSSION

As per the Special Bulletin on MMR released by the Registrar General of India (RGI), the Maternal Mortality Ratio (MMR) of India was found to be 97/lakh live births [11]. Due to COVID-19 infection, the rate of maternal mortality increased all over the world. In our study, the prevalence of maternal mortality due to COVID-19 infection was found to be 7.54 % (15 out of 199 COVID-19 pregnant cases).

In our study, the mortality rate was more in women less than 30 years age compared to women with more than 30 years age group. Studies reported similar reports that the majority of women were in the age group ≤30 yr [12–16].

The normal gestation period ranges from 38 to 42 weeks, studied regarding maternal mortality due to COVID-19 infection reported that the gestation period varies from 5 weeks to full term and the percentage of mortality will be more in preterm pregnant women compared to full-term [17–19]. In our study, 66.7 % of cases had a gestational period of fewer than 36 weeks.

In our study, 46.7 % of cases were primiparous which was similar to the study Chavan et al study where 52.9 % were primiparous patients and all cases were admitted with complaints of fever, cough, abdominal pain, and breathlessness and 80% of cases had acute respiratory distress syndrome followed by other co-morbidity such as hypertension diabetic mellitus valvular heart disease and pre-eclampsia as in other studies [10, 16, 19, 20]. The presence of COVID-19 symptoms in pregnant women leads to maternal and neonatal complications and is allied with increased morbidity and mortality.

Generally, the respiration and pulse rates will be elevated and the percentage of oxygen saturation levels were reduced in COVID-19 cases [21]. Similarly in our study,

the pulse and respiration rate were elevated in 93.3 % of cases and oxygen saturation levels were decreased in 93 % of cases as in Eid et al., study [22].

The mean blood sugar level was found to be 149±71.1 mg/dL and hyperglycemic conditions were noted in 80% of cases in our study. SARS-CoV-2 will trigger diabetic ketoacidosis and the person will develop diabetes mellitus disorders which may be due to the expression of angiotensin-converting enzyme 2 (ACE2) in the pancreas and decrease the pancreatic insulin secretion by cell apoptosis mechanism. It was reported by studies that the onset of diabetics was more in COVID-19 pregnant women compared to normal pregnant women[23, 24].

Studies reported that in COVID-19 pregnant women there was a significant decrease in hemoglobin, white blood cell, neutrophil, and lymphocyte count, compared to healthy pregnant women [25] whereas in our study 53.3 % of the cases were anemic and also leukocytosis, neutrophilia, eosinophilia, Lymphocytosis and thrombocytopenia as well as thrombocytosis, were observed.

Generally, the studies reported hepatic, renal and inflammatory biomarkers are elevated in COVID-19 patients [26–29]. In our study the abnormal levels of Sodium, potassium, creatinine, urea and uric acid. Bilirubin, ALT, AST, ALP, total protein, inflammatory markers (CRP, LDH and ferritin) and coagulation indicators (D-dimer, prothrombin time and activated partial thromboplastin time) levels were elevated which was similar to above-mentioned studies.

Limitation: Short duration of the study.

CONCLUSION

Although the number of maternal mortality appears small, obstetricians need to be well- versed in the factors predictive of poor outcomes. Decoding maternal mortality and strengthening the healthcare delivery systems are vital to saving pregnant women from dying, particularly in low-resource countries.

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