Original Article

Mode of Institutional Delivery of Mothers During COVID-19 Pandemic

Salim A[1], Sultana R[2], Ahmed MU[3], Bhuyan MSI[4], Lima FA[5], Hoshen MM[6], Bristi PD[7]

Abstract

Background: *The current outbreak of the coronavirus disease 2019 (COVID-19) is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). First identified in Wuhan, China, in December 2019, COVID-19 was announced a global pandemic on the 11th of March in 2020 by the World Health Organization (WHO). Pregnancy is associated with physiological changes in women which make them more susceptible to respiratory infections and subsequent rapid progression to respiratory failure. Pregnant women should be evaluated for being potential risk groups in the current COVID-19 pandemic. But the presence of COVID-19 should not affect the method of delivery unless the mother's respiratory state needs immediate attention for giving birth. Compared to the general population, women with COVID-19 have considerably greater rates of cesarean. The objective of the study is to assess the mode of institutional delivery of mothers during COVID-19 pandemic.* ***Materials and Methods****: This cross-sectional study was conducted in Comilla Medical College Hospital, Cumilla, between July 2020 to June 2021. A total of 208 mothers were included who were admitted in the inpatient department or attending the outpatient department of gynaecology and obstetrics for delivery and postnatal care. Data was collected by face-to-face interview through a pretested, semi-structured interview questionnaire. Data was analyzed by SPSS version 25.* ***Results:*** *Majority of the respondents (53.6 %) of this study were in 15-25 years age group. 60.1% mothers had para 1-2 and 91.3% had no history of bad obstetrical events. Among the 208 respondents, most of the respondents were Covid-19 negative (91.8%) and history of birth by caesarean section (66.3%).* ***Conclusion:*** *The study shows that during COVID-19 pandemic, the number of cesarean sections that were performed nearly doubled in comparison to the number from pre covid period.*

Key words: Mode of delivery, COVID-19 pandemic.
Received: July 10, 2024; **Accepted:** August 11, 2024
https://doi.org/10.3329/emcj.v10i1.82513

Introduction

The world has faced numerous issues and obstacles since the new virus, also known as SARS-CoV-2 (COVID-19), broke out[1]. Initially discovered in December 2019 in Wuhan of China, COVID-19 was declared a global pandemic by the World Health Organization (WHO) on March 11th, 2020[2,3]. Chinese scientists discovered the virus to be novel and named it 2019-nCoV or 2019 novel coronavirus. Following this, the disease was designated as Coronavirus Disease-19 (COVID-19) by the World Health Organization (WHO), and the virus was designated as SARS-CoV-2 by the International Committee of Taxonomy of Viruses[3-5].

The majority of the corona virus family's strains are typically linked to colds. Although this paints the picture of a seemingly benign pathogen; this family of viruses has been linked to two significant epidemics over the past 20 years: MERS-CoV, which causes Middle Eastern Respiratory Syndrome (MERS) and SARS-CoV, which causes severe acute respiratory syndrome (SARS). Since both viruses are β-coronaviruses with comparable genomic architectures, they are similar to COVID-19. It is concerning to note that SARS and MERS had case fatality rates (CFRs) of 10% and 37% respectively and caused a horrendous number of over than 10,000 deaths worldwide[4,6]. Approximately one third of the infected pregnant women faced death owing to this illness[1].

Women's bodies changes occur during pregnancy, increasing their vulnerability to respiratory infections and the quick development of respiratory failure[4]. Maternal tolerance to hypoxia is reduced by anatomical changes such as an increase in the thoracic cage's transverse diameter and an increased elevation of the diaphragm. Increased secretions in

[1]Airin Salim, Associate Professor, Department of Community Medicine, Eastern Medical College, Cumilla, Bangladesh.
[2]Rehana Sultana, Associate Professor, Department of Community Medicine, Eastern Medical College, Cumilla, Bangladesh.
[3]Musleh Uddin Ahmed, Associate Professor, Department of Community Medicine, Eastern Medical College, Cumilla, Bangladesh.
[4]Mohammed Saiful Islam Bhuyan, Assistant Professor, Dept. of Community medicine, Noakhali Medical College, Noakhali, Bangladesh.
[5]Fatema Akter Lima, Assistant Professor, Department of Community Medicine, Central Medical College, Cumilla, Bangladesh.
[6]Md. Minuddin Hoshen, Assistant Professor, Department of Community Medicine, Eastern Medical College, Cumilla, Bangladesh.
[7]Priyanka Das Bristi, Assistant Professor, Department of Community Medicine, Eastern Medical College, Cumilla, Bangladesh.

Address of correspondence: Dr. Airin Salim, Associate Professor, Department of Community Medicine, Eastern Medical College, Cumilla, Bangladesh. Mobile: +8801711709407, E-mail: airinsalim@gmail.com

the upper respiratory tract and mucosal edema might result from vasodilation and changes in lung volume. Furthermore, changes in cell-mediated immunity led to pregnant women's heightened vulnerability to intracellular infections like viruses. Considering the ongoing COVID-19 epidemic, pregnant women should be assessed as possible risk groups[7].

Furthermore, the current available evidence based on case series data and expert opinion, accelerated delivery is recommended to enable a 28% decrease in the daily oxygen requirements to support the mother's respiratory stabilization during respiratory failure. In addition, worsening histological signs of hypoxia damage were observed in the placentas of SARS-affected women as the time interval between the beginning of symptoms and the fetus's delivery increased (henceforth referred to as time-to-delivery or TTD). Given the potential consequences for care and prognosis, these features also beg the additional question of whether there were any potential disparities in these outcomes regarding TTD[4].

Since the novel coronavirus disease 2019 (covid-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was initially reported, there has been a sharp rise in the number of confirmed cases as well as the related mortality and morbidity. Given the uncertainties surrounding the impact of COVID-19 on expectant mothers, both during and after pregnancy, as well as on their unborn children, pregnant women are regarded as a high-risk population[8]. Globally, viral pneumonia is the leading cause of pregnancy-related mortality[1]. In China, 8% of pregnant women with COVID-19 reported experiencing severe health-related issues[9].

According to Chinese media, there have been many worries regarding the massive rate of cesarean deliveries (>90%)[2]. The requirement to take action is now tremendously crucial due to the increasing number of cesarean sections worldwide. The presence of COVID-19 should not affect the method of delivery unless the mother's respiratory state needs immediate attention for giving birth. Compared to the general population, women with COVID-19 have considerably greater rates of cesarean sections[10].

Materials and Methods

This study descriptive cross-sectional study was conducted among the mothers admitted in the inpatient department or attending the outpatient department of gynaecology and obstetrics for delivery and postnatal care. A total of 208 mothers were included in this study. The study period was a year from the commencement of the study from July 2020 to June 2021. The study was conducted in the department of gynaecology and obstetrics of Comilla Medical College Hospital, Cumilla. Pregnant mothers who came for delivery to the inpatient department within 7 days of delivery attending the outpatient department gynaecology and obstetrics were included in this study and the data was collected by purposive type of nonprobability sampling technique. A pretested, semi-structured, interview questionnaire was used for data collection by interviewing the mothers. The questionnaire was created based on the selected variables according to the specific objectives. Data was collected by face-to-face interview using the questionnaire. For analysis of data some descriptive statistics were used. This analysis was done by using SPSS and Microsoft Excel software package. Data were presented by appropriate tables, graphs, and standard writing style. Formal approval of the study had been obtained from the Institution Review Board (IRB) of NIPSOM, and ethical clearance was taken from the ethical committee of NIPSOM. Permission for data collection was taken from the Director, Cumilla Medical College Hospital. Informed consent of the participant was taken before data collection.

Results

In this study, among the 208 respondents, the majority, i.e., 121 (53.6 %) were in 15-25 years age group, 92 (44.2%) were in 26-35 years age group, 5 (2.4%) were in 36-40 years age group. Mean age of the respondents was 25.817 ± 4.719 with age range of 17-38 years. Considering the level of education, majority of the women i.e. 120 (57.7%) had secondary and SSC level of education and 44 (21.2%) had HSC and above level of education and rest of the women were 44 (21.2%) illiterate and had primary level of education. Among 208 participants, the majority, i.e., 179 (86.1%) were homemakers, 23 (11.1%) were service holders and 6 (2.9%) were students. Most of the participants, i.e. 112 (53.8%) came from rural areas, while 96 (46.2%) participants came from urban residents. Among the 208 respondents, 93 (44.7%) lived in pacca houses, 85 (40.9%) lived in semi-pacca houses and 30 (14.4%) lived in kaccha houses (table-I).

The present study shows that majority of the women i.e. 125 (60.1%) had para 1-2, 74 (35.1%) had para 3-4 and 9 (4.3%) had para 5 and above. Majority women i.e., 190 (91.3%) had no history of bad obstetrical events, whereas 18 (8.7%) had history of bad obstetrical events. Twenty-eight (37.5%) mothers had complications during pregnancy and among these 28 respondents who had complications during pregnancy, majority i.e., 26 (33.3%) had gestational diabetes mellitus, 19 (24.4%) had antepartum haemorrhage, 19 (24.4%) had preterm labour, 16 (20.5%) had gestational hypertension and 12 (15.4%) had eclampsia (Table-II).

In this study, majority of the respondents i.e., 157 (75.5%) had gestational age more than or equal 37 weeks, while 51 (24.5%) had gestational age less than 37 weeks. Among the 208 respondents, 23 (11.1%) mothers had some sorts of comorbidities. Among these 23 mothers who had comorbidities, most of the mothers (8.2%) had diabetes, 16 (7.7%) had hypertension, 13 (6.2%) had anaemia, 12 (5.8%) had asthma, 12 (5.8%) had thyroid disfunction, 9 (4.3%) had dyslipidaemia and 9 (4.3%) had migraine (Table-II).

Among the 208 respondents, the majority i.e. 191 (91.8%) of the respondents were Covid-19 negative whereas, 17 (8.2%) were Covid-19 positive (Figure-1). Figure 2 shows that among the 208 respondent's majority i.e., 138 (66.3%) gave birth via caesarean section, 68 (32.7%) gave birth via normal vaginal delivery and 2 (1%) gave birth via instrumental delivery. The association between maternal COVID-19 infection and mode of delivery was not statistically significant ($\chi 2$ =0.289, p=0.86) as shown in the table-III.

Table-I: Socio-demographic characteristics of the mothers (n= 208)

Variables	Sub variables	Frequency (n)	Percentage (%)
Age group	15-25 years	121	53.6
	26-35 years	92	44.2
	36-40 years	5	2.4
	Mean ± SD = 25.817 ± 4.719 Range = 17-38 Yrs		
Education	Illiterate & Primary	44	21.2
	Secondary & SSC	120	57.7
	HSC & above	44	21.2
Occupation	Homemaker	179	86.1
	Service holder	23	11.1
	Students	6	2.9
Place of residence	Rural	112	53.8
	Urban	96	46.2
Type of house	Kaccha (mud built)	30	14.4
	Semi-pacca	85	40.9
	Pacca (brick built)	93	44.7

Table-II: pregnancy related information of the mothers (n=208)

Variables	Sub variables	Frequency (n)	Percentage (%)
Para	1-2	125	60.1
	3-4	74	35.1
	≥5	9	4.3
History of bad obstetrical events	Yes	18	8.7
	No	190	91.3
Complication during pregnancy	Yes	28	37.5
	No	130	62.5
Type of complications during pregnancy	Gestational hypertension	16	20.5
	Antepartum haemorrhage	19	24.4
	Gestational diabetes mellitus	26	33.3
	Eclampsia	12	15.4
	Preterm labour	19	24.4
Gestational age	<37 weeks	51	24.5
	Equal or > 37 weeks	157	75.5
Presence of comorbidities	Yes	23	11.1
	No	185	88.9
Type of comorbidities	Diabetes	17	8.2
	Anaemia	13	6.2
	Hypertension	16	7.7
	Asthma	12	5.8
	Thyroid disfunction	12	5.8
	Dyslipidaemia	9	4.3
	Migraine	9	4.3

Table-III: Association between maternal COVID-19 infection and mode of delivery (n=208)

COVID-19 test	Normal Fq (%)	Caesarean Fq (%)	Instrumental Fq (%)	Total Fq (%)	Statistics
Positive	5 (7.4%)	12 (8.7%)	0 (%)	17 (8.2%)	χ^2 =0.289 p= 0.86
Negative	63 (92.6%)	126 (91.3%)	2 (100%)	191 (91.8%)	
Total	68 (100%)	138 (100%)	2 (100%)	208 (100%)	

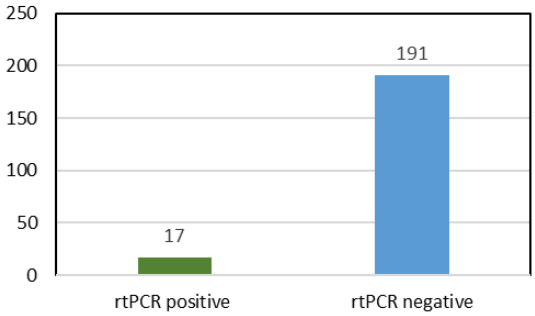

Figure-1: Presence of Covid-19 infection among mothers (n= 208)

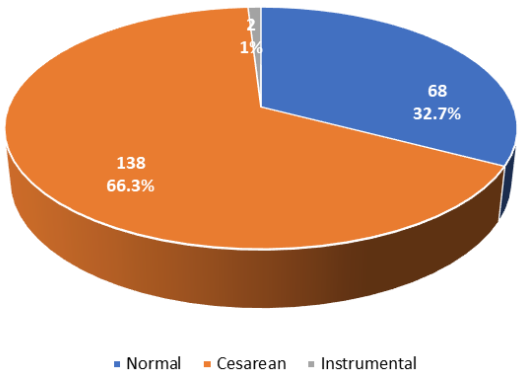

Figure-2: Distribution of participants by their educational qualification (n=309)

Discussion

In this study majority of the women were in the age group 21-25 years (31.7%) with the mean age of 25.81 years. A similar type of study was conducted in Hubei Province of China, where it was found that majority of the women were of the age group of 26-37 years[11]. The difference was due to socio economic status of our country which represents the early age of women to get married. Regarding educational qualification, majority of women (57.7%) had secondary and SSC level education while 21.2% had HSC and above level of education. Another similar study was conducted in Milan, Italy revealed that 78.0% women were from higher education and 22% women were not[12]. The dissimilarity exposes our level of poverty and lack of awareness regarding women education in our country.

By occupation a greater portion of women 86.1% were housewives, that means unemployed. D'Ambrosi, et al.[12] conducted a study and found that 48% women were unemployed, and 52% women were employed. In context of Bangladesh, women empowerment and self-dependency level is still low due to illiteracy and patriarchal society. The government should put more emphasis on this issue. In this study, majority of women 53.8% were rural by residential criteria and 46.2% were urban. Another similar study was conducted in Dhaka found that 51% of pregnant women lived in the urban area followed by 29% in sub-urban and 20% in rural area[13]. Whereas majority (44.7%) of women in this study lived in pacca (brick built) house, 40.9% lived in semi-pacca house and 14.4% lived in kaccha (mud built) house. According to the sample statistics of Bangladesh 2022, 11.3% of people reside in pacca house, 19.6% in semi-pacca house and 66.2% in kaccha house[14].

Based on parity, majority of the women 60.1% had para 1-2, 35.1% had para 3-4 and 4.3% had parity 5 and above. The reason behind this may be because only 14% of sixth- and higher-order births are delivered in health facilities, as compared with 60% of first-order births, as found in Bangladesh Demographic and Health Survey 2017-18[15]. In this study, among the 208 respondents 91.3% had no history of bad obstetrical events, whereas 8.7% had history of bad obstetrical events and majority of the mothers (62.5%) had no pregnancy related illness, while 37.5% had pregnancy related illness. Chi, et al.[16] in their study found 34.62% of the pregnant patients had pregnancy related illnesses. The findings of our study are a little higher than the findings of the article.

Among the 78 respondents who had pregnancy related illness, the majority 33.3% had gestational diabetes mellitus, 24.4% had antepartum hemorrhage, 24.4% had preterm labor, 20.5% had gestational hypertension and 15.4% had eclampsia. In this study, majority of the respondents 75.5% had gestational age ≥37 weeks, while 24.5% had gestational age <37 weeks. Most of the participants of the study, 88.9%, had no comorbidities, while 11.1% of the participants had comorbidities. Among the 11.1% who had comorbidities, 8.2% of them had diabetes, 7.7% had hypertension, 6.2% had anemia, 5.8% had asthma, 5.8% had thyroid disfunction, 4.3% had dyslipidemia and 4.3% had migraine. The majority of the respondents were Covid-19 negative

(191; 91.8%) whereas 17; 8.2% were covid-19 positive among the 208 respondents.

The study reveals that among the 208 respondents, most women, 66.3% of them gave birth by way of caesarian section, while 32.7% of the respondents gave birth through normal vaginal delivery and 1% women gave birth using instrumental delivery. A similar study was conducted in UK which found that during the extensive Covid-19 pandemic, 60% of women gave birth via caesarian section, 30% women gave birth by means of normal vaginal delivery and 11% women gave birth through instrumental or assisted delivery[17]. In the United Kingdom, an aggregate augmentation in the overall incidence of C-section deliveries has been documented during the pandemic[18]. A study by Shanes, et al[19] reported that C-section procedures were prompted by maternal requests during the COVID-19 outbreak. The situation in Turkey is noteworthy, as the country's C-section rate increased from 57.7% in 2019 (before to the pandemic) to 60.2% in 2020[20]. On the contrary, in New York, there was a noticeable decrease in natural and vaginal deliveries, which may be due to the precautionary measures taken by healthcare professionals to reduce the possibility of viral transmission. It seems that there was a belief that choosing C-section procedures might decrease the risk of transmission of disease[21].

The recently reported rise in the number of C-sections could be a sign of concerns about parturition circumstances and the fear that pregnant women will have COVID-19, as well as the risk of transmission in maternity facilities[22]. To make it clear, the fast pace of C-sections decreases the period of time the pregnant woman must wait, which lessens the amount of time the patient spends in a hospital setting during the ongoing pandemic[23]. Moreover, a variety of tactics employed in the fight against the COVID-19 pandemic could result in treatment non-compliance or delays, which would then fuel an increase in acute hospital cases and, in turn, a higher risk of C-section deliveries[24]. Investigations of previous incidents have also highlighted the fact that limited access to maternity care facilities increases the probability of C-section procedures[25,26]. Furthermore, the reported spike in C-section rates during COVID-19 may have been caused by women with prior C-section histories having limited access to natural birthing facilities. This increase may also represent obstetricians coordinated efforts to provide the best care possible in the difficult COVID-19 conditions[27]. However, data indicates that women carrying COVID-19 throughout pregnancy might be more susceptible to higher rates of neonatal and maternal problems, such as premature labor, preeclampsia, and the need for cesarean sections[28]. Another study revealed that there is no evidence to favor one mode of delivery in women with Covid-19[29].

In this study, among the 17 Covid-19 positive women, 12 mothers gave birth via normal vaginal delivery while 5 of them gave birth via caesarian section. The association between maternal Covid-19 infection and mode of delivery was not statistically significant. Cninn, et al[29] also showed in their study that there was no significant increase in cesarean delivery among women with COVID-19. Another study also supports the findings of a current study which was conducted in London, UK and found that 46.7% of Covid-19 positive mothers gave birth via caesarian section[30]. The difference was found due to varying sample sizes.

Conclusion

The study revealed that during COVID-19 pandemic situation two thirds of the mothers who came for institutional delivery gave birth by cesarean sections which was nearly double than the pre-COVID-19 situation. Early in the pandemic, despite the lack of evidence for vertical transmission, COVID-19 status alone became a usual criterion for cesarean delivery. Further research is required to gain a better understanding of the long-term consequences of this heightened rate and to emphasize the implementation of more effective measures to reduce unnecessary cesareans delivery.

Conflict of interest

The authors declared that they have no conflict of interest.

References

1. Dashraath P, Wong JLJ, Lim MXK, Lim LM, Li S, Biswas A, et al. Coronavirus disease 2019 (COVID-19) pandemic and pregnancy. Am J Obstet Gynecol. 2020; 222 (6): 521-31. doi: 10.1016/j.ajog.2020.03.021.
2. Maheshwari B, Sharma P, Panwar K, Goswami KG. Evaluation of maternal and fetal outcome in corona positive pregnant women. Int J Reprod Contracept Obstet Gynecol. 2020; 9 (12): 5037-42.
3. Schwartz DA, Graham AL. Potential Maternal and Infant Outcomes from (Wuhan) Coronavirus 2019-nCoV Infecting Pregnant Women: Lessons from SARS, MERS and Other Human Coronavirus Infections. Viruses. 2020; 12 (2): 194. doi: 10.3390/v12020194.
4. Smith V, Seo D, Warty R, Payne O, Salih M, Chin KL, et al. Maternal and neonatal outcomes associated with COVID-19 infection: A systematic review. PLoS One. 2020; 15 (6): e0234187. doi: 10.1371/journal.pone.0234187.
5. Begum MR, Ehsan N, Ehsan M, Sharif AB. Pregnancy and Childbirth in COVID-19 Positive/Probable and Suspected Patients: A

Comprehensive Review. J Bangladesh Coll Phys. 2020; 38: 91-108. doi: https://doi.org/10.3329/jbcps.v38i0.47443.
6. Yan J, Guo J, Fan C, Juan J, Yu X, Li J, et al. Coronavirus disease 2019 in pregnant women: a report based on 116 cases. Am J Obstet Gynecol. 2020; 223 (1): 111.e1-111.e14. doi: 10.1016/j.ajog.2020.04.014.
7. Zaigham M, Andersson O. Maternal and perinatal outcomes with COVID-19: A systematic review of 108 pregnancies. Acta Obstet Gynecol Scand. 2020; 99 (7): 823-9. doi: 10.1111/aogs.13867.
8. Allotey J, Stallings E, Bonet M, Yap M, Chatterjee S, Kew T, et al. Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis. BMJ. 2020; 370: m3320. doi: 10.1136/bmj.m3320.
9. Chen L, Li Q, Zheng D, Jiang H, Wei Y, Zou L, et al. Clinical Characteristics of Pregnant Women with Covid-19 in Wuhan, China. N Engl J Med. 2020; 382 (25): e100. doi: 10.1056/NEJMc2009226.
10. Chen H, Guo J, Wang C, Luo F, Yu X, Zhang W, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. Lancet. 2020; 395 (10226): 809-15. doi: 10.1016/S0140-6736(20)30360-3.
11. Li N, Han L, Peng M, Lv Y, Ouyang Y, Liu K, et al. Maternal and Neonatal Outcomes of Pregnant Women with Coronavirus Disease 2019 (COVID-19) Pneumonia: A Case-Control Study. Clin Infect Dis. 2020; 71 (16): 2035-41. doi: 10.1093/cid/ciaa352.
12. D'Ambrosi F, Iurlaro E, Tassis B, Di Maso M, Erra R, Cetera GE, et al. Sociodemographic characteristics of pregnant women tested positive for COVID-19 admitted to a referral center in Northern Italy during lockdown period. J Obstet Gynaecol Res. 2021; 47 (5): 1751-6. doi: 10.1111/jog.14729.
13. Mollick MM, Sultana Z, Akhter N. Epidemiology and Short-Term Outcomes of Obstetrical Suspected COVID-19 Patient: A Cross-Sectional Study in a COVID Dedicated Hospital of Bangladesh. J Prev Soc Med. 2021; 39 (2): 45-9. doi: https://doi.org/10.3329/jopsom.v39i2.53165.
14. Statistical Yearbook. Bangladesh 2021. 41st edition. Available at: https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/b2db8758_8497_412c_a9ec_6bb299f8b3ab/2022-06-15-10-49-3cf641425dd693f9e954de5ae9470775.pdf [Accessed on January 12, 2021]
15. Bangladesh Demographic and Health Survey 2017-18. Available at: https://dhsprogram.com/pubs/pdf/FR344/FR344.pdf. [Accessed on August 12, 2020]
16. Chi J, Gong W, Gao Q. Clinical characteristics and outcomes of pregnant women with COVID-19 and the risk of vertical transmission: a systematic review. Arch Gynecol Obstet. 2021; 303 (2): 337-45. doi: 10.1007/s00404-020-05889-5.
17. Knight M, Bunch K, Vousden N, Morris E, Simpson N, Gale C, et al. UK Obstetric Surveillance System SARS-CoV-2 Infection in Pregnancy Collaborative Group. Characteristics and outcomes of pregnant women admitted to hospital with confirmed SARS-CoV-2 infection in UK: national population-based cohort study. BMJ. 2020; 369: m2107. doi: 10.1136/bmj.m2107.
18. McCallum AR, Broom MA, Litchfield KN, Shaw M, Kearns RJ. The effect of COVID-19 on general anaesthesia rates for the caesarean section. Int J Obstet Anesth. 2021; 47: 103188. doi: 10.1016/j.ijoa.2021.103188.
19. Shanes ED, Mithal LB, Otero S, Azad HA, Miller ES, Goldstein JA. Placental Pathology in COVID-19. Am J Clin Pathol. 2020; 154 (1): 23-32. doi: 10.1093/ajcp/aqaa089.
20. Yalçin SS, Boran P, Tezel B, Şahlar TE, Özdemir P, Keskinkiliç B, et al. Effects of the COVID-19 pandemic on perinatal outcomes: a retrospective cohort study from Turkey. BMC Pregnancy Childbirth. 2022; 22(1): 51.
21. Feldman KM, Jagannatham S, Hussain FN, Strauss TS, Al-Ibraheemi Z, Ashmead G, et al. 12 Observations from an inner-city hospital during COVID-19: preterm birth rate and mode of delivery. Am J Obstet Gynecol. 2021; 224 (2): S8. doi: 10.1016/j.ajog.2020.12.024.
22. Taghavi SA, Heidari S, Jahanfar S, Amirjani S, Aji-Ramkani A, Azizi-Kutenaee M, et al. Obstetric, maternal, and neonatal outcomes in COVID-19 compared to healthy pregnant women in Iran: a retrospective, case-control study. Middle East Fertil Soc J. 2021; 26 (1): 17. doi: 10.1186/s43043-021-00059-2.
23. de Azevedo Bicho M, Fernandes MP, Vidaletti LP, Santos Vaz Jd. Cesarean section prevalence at a baby-friendly hospital in southern Brazil: current context in the face of COVID-19. medRxiv. 2021; 5: 21256516. doi: https://doi.org/10.1101/2021.05.03.21256516.
24. Arab W, Atallah D. Cesarean section rates in the COVID-19 era: False alarms and the safety of the mother and child. Eur J Midwifery. 2021; 5: 14. doi: 10.18332/ejm/134998.
25. Zhang J, Zhang Y, Ma Y, Ke Y, Huo S, He L, et al. The associated factors of cesarean section during COVID-19 pandemic: a cross-sectional study in nine cities of China. Environ Health Prev Med. 2020; 25 (1): 60. doi: 10.1186/s12199-020-00899-w.

26. Mengesha MB, Adhanu HH, Weldegeorges DA, Assefa NE, Werid WM, et al. Maternal and fetal outcomes of cesarean delivery and factors associated with its unfavorable management outcomes; in Ayder Specialized Comprehensive Hospital, Mekelle, Tigray, Ethiopia, 2017. BMC Res Notes. 2019; 12 (1): 650. doi: 10.1186/s13104-019-4690-5.
27. Bisht R, Kandalgaonkar VP, Shinde KK. Cesarean Section Rate among COVID-19 Mothers and Its Classification through Robson's Criteria. J South Asian Feder Obst Gynae. 2021; 13 (5): 342-6.
28. Mahtab NT, Chowdhury TS. Clinical outcomes of women with COVID 19 during pregnancy: an update. BIRDEM Med Journal. 2020; 10 (COVID Supplement): 93-102.
29. Chinn J, Sedighim S, Kirby KA, Hohmann S, Hameed AB, Jolley J, et al. Characteristics and Outcomes of Women With COVID-19 Giving Birth at US Academic Centers During the COVID-19 Pandemic. JAMA Netw Open. 2021; 4 (8): e2120456. doi: 10.1001/jamanetworkopen.2021.20456.
30. Elsaddig M, Khalil A. Effects of the COVID pandemic on pregnancy outcomes. Best Pract Res Clin Obstet Gynaecol. 2021; 73: 125-36. doi: 10.1016/j.bpobgyn.2021.03.004.

Citation of this article
Salim A, Sultana R, Ahmed MU, Bhuyan MSI, Lima FA, Hoshen MM, Bristi PD. Mode of Institutional Delivery of Mothers During COVID-19 Pandemic. Eastern Med Coll J. 2025; 10 (1): 6-12.