

Analysis of Poor Perinatal Outcome During COVID-19 Pandemic Lockdown: A Cross Sectional Study

Sarita Sitaula^{1*}, Tulasa Basnet², Manisha Chhetry², Pritha Basnet², Lokraj Shah³, Pawan Mahat⁴

¹Siddhi Memorial Hospital, Bhaktapur, Nepal. ²BP Koirala Institute of Health Sciences Dharan, Nepal. Department of Obstetrics and Gynecology, Nepal. ³BP Koirala Institute of Health Sciences Dharan, Nepal. Department of Pediatrics, Nepal. ⁴Department of Ophthalmology, Patan Academy of Health sciences, Kathmandu, Nepal. *Corresponding Author's Email: dr.sarita.sitaula@gmail.com

ABSTRACT

Fear of hospitalization in addition to uncertainties about appropriate treatment at the beginning of COVID -19 pandemic may have affected the health and outcome of pregnant women. Lack of transportation closed out-patient services, and lack of employment has directly linked to poor maternal and perinatal outcomes during nationwide lockdown. This study was aimed to find out the poor perinatal outcome during the first COVID-19 pandemic lockdown at BP Koirala Institute of Health Sciences (BPKIHS), Dharan, Nepal. This was a descriptive cross-sectional study conducted in BPKIHS from 24th March 2020 to 23rd July 2020 during the first COVID- 19 lockdown for the duration of 4 months. The data were collected between 1st February to 15th February 2021 from the hospital records. Convenience sampling was done. Data analysis was done by SPSS version 24. Poor perinatal outcomes: perinatal death, preterm delivery, intrauterine growth restriction, newborn admission, and different reasons for admission were analyzed using descriptive statistics. There were a total of 2685 obstetric admissions and 2442 deliveries during the study period of 4 months. Mean age and gestational age of women with poor perinatal outcome were 27.16 ± 6.02 years and 36.38 ± 4.54 weeks respectively. The perinatal death rate was 26.2 per 1000 births. 128 newborns required neonatal admission and prematurity was the most common cause. The prevalence of poor perinatal outcome was like other studies done in similar settings. However, larger, comparative studies are needed to identify a definite association of COVID 19 pandemic lockdown with poor perinatal outcomes.

Keywords: COVID-19, Lockdown, Perinatal death, Perinatal outcome, Preterm birth.

Introduction

The concern was increasing with COVID -19 outbreak, will disrupt health service delivery, particularly in resource limited countries (1). The response of national lockdown has had an indirect impact on women and babies due to travel restrictions and fear of going to hospital due to COVID 19 infection (2). This pandemic also had an impact on reproductive and perinatal health both directly through infection or indirectly as a consequence of changes in health care practices, social and financial circumstances, and national lockdowns (3). Fear and anxiety about the possibility of infection during hospital visits affected antenatal services, screening of complications and institutional

deliveries and stress during the pandemic creating an adverse intrauterine environment which could have resulted in preterm delivery and low birth weight baby (4-5).

The study has shown that institutional delivery was reduced by more than half during lockdown with increase in rate of stillbirth and poor perinatal outcome and decrease in quality of care (6). Poor pregnancy outcome is defined as stillborn, preterm birth, intrauterine growth restriction (IUGR) or term admission to the neonatal care unit for perinatal asphyxia (7). This study aimed to find out poor perinatal outcome during COVID-19 pandemic lockdown at BPKIHS.

This is an Open Access article distributed under the terms of the Creative Commons Attribution CC BY license (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted reuse, distribution, and reproduction in any medium, provided the original work is properly cited.

(Received 03rd July 2023; Accepted 25th July 2023; Published 30th July 2023)

Materials and Methods

This study was conducted at B.P. Koirala Institute of health Sciences (BPKIHS), is a tertiary care center located in province 1 of Nepal. The hospital provides obstetric and gynecological services to the women of Eastern part of Nepal as well as some parts of India. The study design was Descriptive Cross- Sectional Study. The study population included all perinatal deaths and inborn newborn requiring hospital admission and management. The study was conducted from 24th March 2020 to 23rd July 2020 during the first COVID- 19 lockdown for the duration of 4 months. The data were collected between 1st February to 15th February 2021 from the hospital records.

The study was conducted after ethical clearance from the Institutional Review Committee (IRC number: IRC/2034/020 of the hospital. The Hospital director and the Head of the Department of the hospital were informed about the purpose of the study and the confidentiality of the information obtained is assured. Informed consent from the patient to review their case sheets was waived due to retrospective and non- interventional study design. The information was collected from the case notes and daily records of the maternity and delivery sections of the hospital during the study period.

The study population included all perinatal deaths occurring in the Department of Obstetrics and Gynecology and Department of Pediatrics and Adolescents after 22 weeks of gestation to the 7th day of neonatal life. All the newborns who required admission for further investigation and management were also studied.

The exclusion criteria included newborns referred to other centers due to unavailability of neonatal care in the hospital, newborn admitted to NICU from the other centers or delivered outside as details of antepartum/ intrapartum and postpartum records would not be available. The gestational age was calculated from the first day of the last menstrual period (LMP) or by the earliest scan when LMP is not known.

The data were collected from the medical records section of the hospital after reviewing the files. Structured proforma was used to collect data on demographic parameters, obstetric parameters,

outcome of the baby, cause of perinatal death, or reason for neonatal admission. Data was entered in Microsoft Excel and analysis was done by SPSS version 24.

Sample size

All perinatal death and neonatal admissions meeting inclusion criteria over the period of 4 months following implementation of the first lockdown after COVID-19 pandemic.

Study variables

Demographic characteristics: age, gravida

Obstetric characteristics: antenatal care, gestational age at delivery, mode of delivery, any risk factors or complications during pregnancy (HTN, IUGR, amniotic fluid disorder, APH)

Variables related to perinatal death: perinatal death rate, early neonatal death rate, risk factor of perinatal death

Variables related to neonatal admission: reason for admission, outcome of the newborn

Definition of the study variable

Booked: At least one antenatal visit to the hospital

Unbooked: No antenatal checkup at the hospital

Perinatal death: It is the total number of stillbirth plus the total number of early neonatal deaths

Stillbirth: Death of fetus after 22 weeks of gestational age up to delivery which includes both antepartum and intrapartum fetal death

Early neonatal death: Defined as death of a newborn up to the 7th day of neonatal life.

Poor perinatal outcome: It is defined as stillborn, pre-term birth, IUGR or term admission to the neonatal care unit for perinatal asphyxia

Pre- term birth: baby is born before 37 weeks of pregnancy have been completed

Liquor volume disorder: oligohydramnios (AFI <5cm) or polyhydramnios (>25cm)

IUGR: fetal weight is below the 10th percentile for gestational age

Data collection tool

The data of perinatal death were collected from the perinatal death review (PDR) form designed by the Government of Nepal, Family Health Division, as this is one of the hospitals with maternal and perinatal death surveillance and response (MPDSR) in function.

For those newborns who required admission the details were recorded in the predesigned proforma.

Statistical analysis

The data were entered in a Microsoft Excel sheet and checked for normality using Kolmogorov- Smirnov test. The analysis was performed using SPSS version 24. Frequency and percentage were used for categorical variables whereas mean and standard deviation were calculated for continuous variables and presented in tables. The characteristics of the study population and prevalence of perinatal death were presented in percentage and absolute numbers.

Results

Total number of obstetric admissions during the study period was 2685 and the total number of deliveries was 2442. A total of 64 perinatal deaths (60 stillbirths and 4 early NND) had occurred during

this time, whereas 128 number of newborns required admission for different indications. The perinatal death rate was 26.2 per 1000 births. Forty three newborns were referred to the other centers from labor room and operation theater due to unavailability of the bed in the neonatal/NICU pool. Twelve newborns were taken to LAMA due to different reasons as most of their pregnancies were either terminated due to diagnosed lethal congenital anomalies or few of them were diagnosed at the time of delivery. The rate of cesarean section during the study period was 42.22%.

The most common age group of women with poor perinatal outcome was 20 to 34 years with a mean age of 27.16 ± 6.02 years. Almost 54% of women belonged to multigravida, 84.9% of women were unbooked, and 61.5% of women had presented in term gestation. The Baseline characteristics of the study population are presented in Table 1.

Table 1: Baseline characteristics of the study population

Characteristics (n=192)	Frequency (%)	Mean $\pm$ SD
Age(years)		27.16 $\pm$ 6.02
<19	11(5.7)	
20-34	159(82.5)	
>35	22(11.5)	
Gravida		
1	89(46.36)	
>2	103(53.64)	
Booked	29(15.1)	
Unbooked	163(84.9)	
Gestational Age(weeks)		36.38 $\pm$ 4.54
<34	45(23.40)	
34-37	29(15.1)	
>37	118(61.5)	
Mode of delivery		
Vaginal	109(56.8)	
cesarean	83(43.2)	
Birth weight(grams)		2423.98 $\pm$ 935.28
<2500	93(48.4)	
2500-4000	95(49.5)	
>4000	4(2.1)	
Pregnancy type		
Singleton	178(92.70)	
Twin	14(7.30)	
Sex of the fetus/neonate		
Male	114(59.4)	
Female	78(40.6)	

Table 2: Indication of Neonatal Admission

Reason for admission	N=128(%)
RDS	38(29.68)
Perinatal depression	27(21.09)
Prematurity	15(11.72)
NNH	13(10.2)
Feeding difficulty and symptomatic Hypoglycemia	12(9.37)
IUGR	6(4.7)
Early onset neonatal sepsis	8(6.3)
#Others	9(7.03)

#Others included newborn admitted for observation due to maternal vascular disease, cleft lip, mother with syphilis.

Table 3: Maternal risk factors among admitted newborns

Maternal risk factors	Number (%)
HTN	14(10.93)
DM	6(4.69)
Liquor volume disorder	6(4.69)
Twin pregnancy	8(6.25)
PTL	12(9.37)
PPROM/PROM	13(10.16)
No known risk factor identified	58(45.32)
#Others	11(8.59)

#Others include APH, Maternal heart disease, syphilis, UTI, vascular disease.

Among the total live born at hospital, 128 newborns required admission during the study period for different reasons. Almost 84 % of the pregnancies were unbooked, more than 50% were primigravida, and most of the women were in 20 to 34 years of age group. Regarding the mode of delivery, 53.9% of the newborn were delivered by cesarean section, and 75.8% were at term.

Among the 69 cesarean sections who required neonatal admission, the most common indication for cesarean section was repeat cesarean (12/69) followed by fetal distress (8), failed induction (8). Six women had undergone cesarean section for malpresentation. Other indications for cesarean section were for fetal distress, failed induction, and labor disorder.

Almost 90 % of the newborn who required admission were improved. One newborn was referred to the other centers for need of ventilatory support as the ventilator was not available at the time of intubation. Ten newborns were taken to LAMA (left against medical advice) as the parents didn't want further treatment due to financial

constraints or they were not improving. Three newborns died during treatment but after completing the first seven days of life, so they were excluded from the early NND group.

The indications of neonatal admission are shown in Table 2. The most common causes for admission were respiratory distress syndrome and perinatal depression. Prematurity accounted for around 12% of the causes followed by neonatal hyperbilirubinemia. Seventy five percentage of the newborn were admitted from the operating room and labor room immediately after delivery, whereas the rest were admitted from post-delivery wards mostly on the 1st and 2nd day of life for other reasons. Around 10% of newborns were admitted for feeding difficulties and symptomatic hypoglycemia.

As shown in Table 3, pre-labor rupture of membrane, hypertension, and preterm labor were mostly associated with neonatal admission. Multiple pregnancy was a risk factor in 6.25% of cases. Around 45% of women had no identified risk factors in mothers.

Table 4 shows the characteristics of the mother of stillbirth and early NND. Mostly the pregnancy was unbooked, with maternal age ranging from 20 to 34 years. Sixty percentage of stillbirths were admitted from outside with documented findings of intrauterine fetal death (IUFD) and were not in labor during admission. Forty percent of stillbirth had presented in labor. They were either diagnosed as stillbirth and referred or directly presented in an emergency with no fetal heart sound detected at

admission. Almost half of the stillbirth cases had presented less than 34 weeks of gestation with a mean gestational age of 33.0 ± 5.12 weeks. Seventy-eight percent were delivered by vaginal route. The most common indications of cesarean in stillbirth were previous cesarean section cases (6/13 case). Other indications were ruptured uterus, previous cesarean with failed induction, placenta previa, and transverse lie.

Table 4: Baseline characteristics of mother with stillbirth and early NND

Variables	Type of death Frequency (%)		
	Stillbirth(n=60)	Early NND(n=4)	
Booked	7(11.7)	1(25)	
Unbooked	53(88.3)	3(75)	
ANC			
Received	53(88.33)	4(100)	
Not received	2(3.33)		
Don't know	5(8.34)		
Age (Mean $\pm$ SD)	28.10 $\pm$ 7.12	24.00 $\pm$ 4.08	28.10 $\pm$ 7.12
<19	5(8.3).	1(25)	
20-34	45(75.0)	3(75)	
>35	10(16.7)	0	
Gravida			
1	21(35.0)	2(50)	
>2	39(65.0)	2(50)	
Mother at admission			
NIL	36(60.0)	1(25)	
LSOL	13(21.7)	3(75)	
ASOL	11(18.3)	0	
Gestational age(weeks)	33.0 $\pm$ 5.12.	39.75 $\pm$ 0.96	33.0 $\pm$ 5.12
<34	28(46.7)	0	
34-37	15(25.0)	4(100)	
>37	17(28.3).	0	
Mode of delivery			
Vaginal	47(78.3)	3(75)	
Cesarean	13(21.7).	1(25)	
Birth weight(grams)	1839.40 $\pm$ 992.63	2962.50 $\pm$ 438.51	1839.40 $\pm$ 992.63
<2500	43(71.7).	0	
2500-4000	15(25.0)	4(100)	
>4000	2(3.3)		
Single	54(90.0)	4(100)	
Twin	6(10.0)	0	
Sex			
Male	31(51.7).	3(75)	
Female	29(48.3)	1(25)	

Table 5: Risk factors for Stillbirth

Risk factors	Stillbirth(n)	Early NND(n)
APH	7	
LCA	6	1
IUGR	8	
Liquor volume disorder	4	
HTN	10	
Spontaneous PTL	2	
Others*	15	3
No risk factor identified	8	

*Others: maternal fever, obstetric cholestasis, GDM, ITP, cord prolapse, head entrapment.

Among early NND, all cases had received ANC. Seventy-five percent of cases had presented in the latent stage of labor, all were between 34 to 37 weeks of gestation. Cesarean section was performed for 1 case out of 3 with meconium stained liquor but the baby expired within 1 hour of life. Five minute APGAR scores ranged from 2 to 8.

The maternal risk factors associated with stillbirth and early NND are as shown in Table 5. The most common risk factors for SB were maternal HTN, IUGR, liquor volume disorder, antepartum hemorrhage. One case of NND had a congenital anomaly(meningomyelocele) and another one had a history of PPRM. The other two cases didn't have any identifiable maternal risk factors.

According to timing of death, 68% had an antepartum fetal death, 22% intrapartum fetal death, and 10% were associated with lethal congenital anomalies. Among lethal congenital anomalies (LCA), all 6 patients were admitted for termination of pregnancy in view of LCA detected during the 2nd and early 3rd trimester scan.

Discussion

We have analyzed the perinatal outcome during the covid 19 pandemic first lockdown at a tertiary care center in province 1. There was total 2685 obstetric admissions, 2442 deliveries, and 64 perinatal deaths during the study period of four months. One hundred and twenty- eight newborns required neonatal admission for different indications. The poor perinatal outcome was not increased in Covid-19 pandemic lockdown as compared to pre- pandemic time. The perinatal death rate was 26.2 per 1000 births, which is similar to the pre -pandemic time (8). The total number of hospital admissions and deliveries were reduced during pandemic lockdown,

but poor perinatal outcome and perinatal death remained static. Reduction in hospital admissions and deliveries could be because of lockdown, fear of infection, and economic uncertainty. The rate of deliveries and hospital admission of the same duration of the previous year was not available due to some reason, which would have provided more specific results. In a study conducted in Nepal regarding the effect of COVID-19 pandemic response on pregnancy outcome, it was found that the institutional deliveries were reduced by approximately half in comparison to pre- pandemic period (6).

The rate of cesarean section was 42.22%, which is like pre-pandemic time. According to the hospital record, the average rate of cesarean section ranged from 38 to 46% of total deliveries in the previous year. According to other studies, the rate of cesarean section was increased from pre- pandemic period including the rate of primary cesarean. They also found that rate of spontaneous labor was higher during Covid 19 pandemic. They have also found out there is no increase in poor perinatal outcome during Covid -19 Pandemic lockdown (9-10).

As we have included only poor perinatal outcome in the study, almost 62% of women had presented in term gestation (>37 weeks). We have not calculated the rate of preterm birth among all deliveries. Other studies have shown no difference in the overall risk of preterm birth, stillbirth, or other perinatal outcomes during the COVID-19 pandemic (11).

In our study, the common indications for neonatal admission were for respiratory distress, perinatal depression, and prematurity. Among them, almost 40% were low birth weight babies. These findings are similar to other studies (12-13). Those babies

who required neonatal admission had associated risk factors like prematurity, pre-labor rupture of membrane, multifetal pregnancy, however, no associated risk factors were identified in 45.32% of cases. Neonatal admission was more in women aged between 20 to 34 years, gestational age of more than 37 weeks, birth weight of 2500 to 4000gram. These findings are like the findings done in Jordan (13).

Among the admitted newborns, almost 90% were improved and discharged home after a few days to a week of hospital stay. Ten newborns were taken to LAMA by their guardian after counselling the neonatal prognosis of the condition as they were either not improved or due to financial constraints.

In our study, we had 60 stillbirths during the study period with a stillbirth rate of 24.57 per 1000 births. The common risk factors were maternal HTN, IUGR, APH, which is like other study (14). No risk factors could be identified in 14% of cases. According to Wigglesworth classification, 68% of deaths were antepartum deaths. Ten percentage of delivery was for lethal congenital anomalies. These findings are similar to the pre- covid pandemic time of the hospital (8). The association of lethal congenital anomaly may not have been directly linked with COVID infection, but might have been associated with late detection due to COVID pandemic lockdown. The number of COVID positive cases are not mentioned here as we had provided services to COVID patient in COVID hospital which was located inside the premises but was different than the regular hospital setup.

This study was retrospective in nature because of which the information about socioeconomic status, literacy, geographical location, and difficulty faced in transportation due to lockdown could not be assessed. It would have been better if we could have compared with the findings of similar calendar months of the previous year. This may have helped to determine the actual association of pandemic lockdown with poor perinatal outcome indicators. This study was conducted in a single center, so the findings cannot be generalized and different delays were not identified. If delays were identified, which might have helped the hospital and provincial governments to solve the problem to reduce future poor perinatal outcomes.

Conclusion

The prevalence of poor perinatal outcome was like other studies done in similar settings. However, larger, comparative studies are needed to identify a definite associations of COVID 19 pandemic lockdown with poor perinatal outcomes.

Acknowledgement

We would like to acknowledge Mr. Sunil Parajuli and all the staffs of medical record section for making the patient case records available timely. We would also like to acknowledge all the nursing staffs of different wards for maintaining the patient records properly which helped in easy identification of the perinatal death and newborn requiring neonatal admission.

Conflict of Interest

None

Funding for the study

Not applicable

Reference

1. Menendez C, Gonzalez R, Donnay F, Leke RGF. Avoiding indirect effects of COVID-19 on maternal and child health. *Lancet Glob Heal*. 2020;8(7):e863–4.
2. Graham WJ, Afolabi B, Benova L, Campbell OMR, Filippi V, Nakimuli A, et al. Protecting hard-won gains for mothers and newborns in low-income and middle-income countries in the face of COVID-19: Call for a service safety net. *BMJ Glob Heal*. 2020;5(6):1–5.
3. Pountoukidou A, Potamiti-Komi M, Sarri V, Papapanou M, Routsis E, Tsiatsiani AM, et al. Management and prevention of COVID-19 in pregnancy and pandemic obstetric care: A review of current practices. *Healthc*. 2021;9(4).
4. Khalil A, Von Dadelszen P, Draycott T, Ugwumadu A, O'Brien P, Magee L. Change in the Incidence of Stillbirth and Preterm Delivery during the COVID-19 Pandemic. *JAMA - J Am Med Assoc*. 2020;324(7):705–6.
5. Dunkel Schetter C, Tanner L. Anxiety, depression and stress in pregnancy: Implications for mothers, children, research, and practice. *Curr Opin Psychiatry*. 2012;25(2):141–8.
6. KC A, Gurung R, Kinney M V., Sunny AK, Moinuddin M, Basnet O, et al. Effect of the COVID-19 pandemic response on intrapartum care, stillbirth, and neonatal mortality outcomes in Nepal: a prospective observational study. *Lancet Glob Heal*. 2020;8(10):e1273–81.
7. Dutton PJ, Warrander LK, Roberts SA, Bernatavicius G, Byrd LM, Gaze D, et al. Predictors of poor perinatal outcome following maternal perception of reduced fetal movements - a prospective cohort study. *PLoS One*. 2012;7(7).
8. Sitaula S, Agrawal A, Basnet T, Das A, Das D, Kafle SP. Epidemiological Profile of Perinatal Mortality at a

- Tertiary Care Center in Eastern Nepal. *ARJOG*. 2020;3(3):39–44.
9. Yalçın SS, Boran P, Tezel B, Şahlar TE, Özdemir P, Keskinliç B, et al. Effects of the COVID-19 pandemic on perinatal outcomes: a retrospective cohort study from Turkey. *BMC Pregnancy Childbirth*. 2022;22(1):1–12.
 10. Subedi A, Magar P, Shrestha J, Subedi S. Impact of Lockdown of COVID 19 Pandemic in Pregnancy Outcomes in a Tertiary Care Centre: What to expect? *J Lumbini Med Coll*. 2022;9(2).
 11. Simpson AN, Snelgrove JW, Sutradhar R, Everett K, Liu N, Baxter NN. Perinatal Outcomes during the COVID-19 Pandemic in Ontario, Canada. *JAMA Netw Open*. 2021;4(5):2021–3.
 12. Namrata KC, Shrestha B, Bhattarai A, Paudel S, Subedi N. Pattern of morbidity and mortality among neonates admitted to neonatal intensive care unit in tertiary care centre, western Nepal. *J Gandaki Med Coll*. 2021;14(1):24–8.
 13. Al-Momani MM. Admission patterns and risk factors linked with neonatal mortality: A hospital-based retrospective study. *Pakistan J Med Sci*. 2020;36(6):1–6.
 14. Aminu M, Bar-Zeev S, White S, Mathai M, Van Den Broek N. Understanding cause of stillbirth: A prospective observational multi-country study from sub-Saharan Africa. *BMC Pregnancy Childbirth*. 2019;19(1):1–10.