

# Impact of Covid-19 Pandemic on Institutional Deliveries and Their Perinatal Outcome: A Hospital Based Study

Nirajana Kayastha, Namrata Sindan, Sandeep Shrestha, Kamal Thani, Sharmila Shrestha, Karnali Academy of Health Sciences (KAHS), Jumla

**Corresponding Author:** Dr. Nirajana Kayastha, Department of Pediatrics, Karnali Academy of Health Sciences, Jumla, Nepal. Email: [nirajanakayastha@gmail.com](mailto:nirajanakayastha@gmail.com). Phone: +9779868359330

## Abstract

**Background:** Current scenario of novel coronavirus (COVID-19) pandemic pose challenge for effective utilization and accessibility of health services. Various interventions introduced countrywide to contain the disease can have an indirect impact on essential health services ; one of the core area being maternal and newborn health services. Hence, the present study was conducted to determine trend of institutional deliveries and their outcome before and during COVID-19 pandemic.

## Methods:

This was a retrospective observational study carried out in Karnali Academy of Health Sciences (KAHS). Data on socio demographic characteristics, obstetrics and perinatal characteristics of cases who delivered over a period of a year from September 2019 till September 2020 was retrieved from maternal and neonatal records.

## Results:

During the study period, among 740 women enrolled in the study, 418(56.4%) delivered prior to COVID-19 pandemic and 322(43.6%) during pandemic. Monthly trend of institutional deliveries showed a decline in number of deliveries and women receiving adequate antenatal care visits (ANC) during the pandemic. There was increase in incidence of adverse perinatal outcome during pandemic which consisted preterm births (7.3% before vs 9.6% during pandemic), increased neonatal admissions (9.5% before vs 20% during pandemic) and delivery of low birth weight babies (16.2% before vs 18% during pandemic). Neonatal mortality rate increased from 12.2 per 1000 live births before pandemic to 38 per 1000 live births during pandemic. Still birth rate increased from 26.3 per 1000 total births before pandemic to 43.4 per 1000 total births during pandemic .

## Conclusion:

There was a decrease in antenatal care visits, institutional deliveries with increase in adverse perinatal outcome in our study. These findings call for adoption of effective policies that could be met within our resources for uninterrupted, easy accessibility and availability of maternal and neonatal health services during current pandemic scenario.

**Keywords:** Deliveries; Health; Maternal; Neonatal; Pandemic

Access this article Online		Article Info.	
<b>Quick Response Code</b>	<b>How to cite this article in Vancouver Style?</b>		
	Received: 1 December 2020    Accepted: 1 December 2020    Published Online: 1 December 2020		Conflict of Interest: None
	Source of Support: Self		
<p><b>Copyright:</b> © 2020 by author(s) in which author(s) are the sole owners of the copyright of the content published with copyright transfer agreement between the Journal and authors to publish in open access.</p> <p><b>Licensing:</b> The Journal follow open access publishing policy, and available freely in the website of the Journal: <a href="http://www.jkhas.org.np">www.jkhas.org.np</a>, and is distributed under the terms of the <a href="https://creativecommons.org/licenses/by/4.0/">Creative Commons Attribution International License 4.0</a>  under the CC-BY 4.0 license, and the author(s) retain the ownership of the copyrights and publishing rights without restrictions for their content, and allow others to copy, use, print, share, modify, and distribute the content of the article even in commercial purpose as long as the original authors and the journal are properly cited. No permission is required from the author/s or the publishers. Appropriate attribution can be provided by simply citing the original article.</p> <p><b>Disclaimer:</b> The statements, opinions and data contained in this publication are solely those of the individual author(s) and contributor(s). Neither the publisher nor editor and reviewers are responsible for errors in the contents nor any consequences arising from the use of information contained in it. The Journal as well as publisher remain neutral with regards to any jurisdictional claims in any published articles, its contents and the institutional affiliations of the authors.</p>			

## INTRODUCTION

On March 11, 2020, WHO declared the novel coronavirus (COVID-19) outbreak a global pandemic.<sup>1</sup> As of 15<sup>th</sup> November 2020, it account for more than 52 million cases and one million deaths worldwide.<sup>2</sup> To contain the disease, one of the major intervention taken by government was imposing lockdown which led to restriction of movement of people, closure of borders and reduction of public transport. The next being diversion of health workers and other resources towards pandemic response. These interventions according to WHO impact on provision of essential health services due to which patient with disease unrelated to pandemic face difficulty to access needed health services.<sup>3</sup>

One of the core area of concern is uninterrupted provision of maternal and neonatal health services. According to NDHS 2016, maternal mortality has decreased by 52.3% and neonatal mortality by 58% over last two decades in Nepal. The number of ANC increased by a quarter between 2011 and 2016 with a remarkable 22% increase in the proportion of institutional deliveries between the same period.<sup>4</sup> Report from previous outbreak of Ebola in West Africa showed decline in access and utilization of health services that led to increased mortality, morbidity and decreased life expectancy.<sup>5</sup>

Though modelling studies have tried to estimate the magnitude and consequences of disruption of these essential services during the COVID-19 pandemic, till date there is little facility based data to support interruption of these services and their aftermath.<sup>6,7</sup> Hence, we aimed to access maternal and neonatal outcome comparing scenario before and during the pandemic

## MATERIALS AND METHODS

This was a retrospective observational study carried out in KAHS. KAHS is a tertiary hospital located in Jumla. It is a referral point for neighboring districts as Mugu, Kalikot, Dolpa and Humla. Data was collected for a year period which included six months prior to COVID-19 pandemic (September 20, 2019-March 20, 2020) and six months during COVID-19 pandemic (March 21-September 21, 2020). The six months of pandemic included three months of complete lockdown, two months of intermittent lockdown followed by a month lockdown relaxation. Data was collected from maternal and neonatal records from Department of Obstetrics and Gynecology and Department of Neonatology from September 20, 2019 till September 21, 2020.

Data included socio demographic characteristics, obstetrics and perinatal characteristics of cases who delivered in KAHS over the study period. Inclusion criteria were women at 22 weeks of gestation or more who delivered in this hospital. Those with gestation age less than 22 weeks and delivered in out of hospital settings were excluded from the study. The maternal variables included age, residence, antenatal care (ANC) visit and mode of delivery. Perinatal outcome included variables as gestational age, gender, birth weight, morbidity and mortality profile of the neonates. The data was entered and analysed using SPSS 16. The study was commenced after taking ethical approval from Institutional Review Committee (IRC) of KAHS (ref:077/078/013).

## RESULTS

Among 740 women enrolled in the study during the study period, 418(56.4%) delivered

prior to COVID-19 pandemic and 322(43.6%) during the COVID-19 pandemic. Observing the monthly trend of deliveries, a substantial decrease in the number of deliveries was observed after month 7 which was after mid-March 2020 when countrywide lockdown was imposed; the sharpest decline was observed from March to April 2020 following complete lockdown declaration. It was followed by a slight increase in the following month but thereafter there was a continuing decline in the trend of deliveries till the end of study period (Figure 1).



Figure 1: Number of monthly hospital deliveries

The mean age of women giving birth before pandemic was 23+/-4.43 SD which increased to 24.2+/-4.3 SD during pandemic. The proportion of women who had no prior ANC visits increased from 48.5% (n= 202) before pandemic to 57.2% (n=185) during pandemic. Most of the women were nulliparous both before and during pandemic accounting for 50% and 46% of the total cases respectively. More than three fourth of the total cases (n=594) had vaginal deliveries with 81% before pandemic and 79.6% during pandemic. Male predominance was observed among the deliveries before and during pandemic accounting for 52.7% and 54.2% of the total cases respectively. (Table 1)

Table 1: Sociodemographic and obstetrics characteristics of study population and birth characteristics of neonates delivered before and during COVID-19 pandemic:

Characteristics	Pre-COVID period (n,%)	COVID period (n,%)
Age of mothers (mean+/-SD)	23+/-4.43 SD	24.2+/-4.3 SD
Age category		
Less than 18 years	75(18%)	66(20.4%)
More than 18 years	343(82%)	256(79.6%)
<b>Parity</b>		
nulli	209(50%)	148(46%)
primi	125(30%)	121(37.6%)
multi	84(20%)	53(16.4%)
<b>ANC</b>		
None	202(48.5%)	185(57.2%)
Incomplete	190(45.5%)	123(38.6%)
Complete	26(6%)	14(4.2%)
<b>Mode of delivery</b>		
Spontaneous vaginal delivery	338(81%)	256(79.6%)
Instrumental delivery	6(1.4%)	8(2.4%)
Caesarean delivery	67(16%)	53(16.4%)
Breech delivery	7(1.6%)	5(1.6%)
Birth weight (mean +/-SD)	2853+/-530 SD	2854+/-580 SD
<b>Birth weight category</b>		
Normal	350(83.8%)	264(82%)
Low birth weight	68(16.2%)	58(18%)
<b>Gestational age</b>		
preterm	31(7.3%)	32(9.6%)
term	369(88.4%)	277(86.1%)
Post term	18(4.3%)	14(4.3%)
<b>Gender</b>		
male	220(52.7%)	174(54.2%)
female	198(47.3%)	148(45.8%)

There was a marginal increase in the proportion of women who delivered via Cesarean section from 16% (n=67) before pandemic to 16.4% (n=53) during pandemic (p value=0.8) as shown in table 3. The proportion of preterm births increased from 7.3% (n=31) before pandemic to 9.6% (n=32) during

pandemic (p value=0.2). The proportion of babies who were admitted to neonatal intensive care unit (NICU) significantly increased during pandemic (9.5% before pandemic vs 20% during pandemic) (p=0.03). There was also an increase in the proportion of low birth weight (LBW) babies delivered during pandemic (16.2% before pandemic vs 18% during pandemic) (p value=0.54). There was also an increase in the proportion of neonatal mortality and still birth noted during pandemic. The proportion of neonatal death increased from 1.3% (n=5) before pandemic to 3.7% (n=12) during pandemic which was statistically significant (p value=0.03). Neonatal mortality rate increased from 12.2 per 1000 live births before pandemic to 38 per 1000 live births during pandemic. Still birth rate increased from 26.3 per 1000 total births before pandemic to 43.4 per 1000 total births during pandemic (Table 2).

Table 2: Perinatal characteristics of institutional deliveries before and during COVID-19 pandemic:

Characteristics	PreCOVID period	COVID period	P value
Preterm birth	31(7.3%)	32(9.6%)	0.20
Still birth	11(2.6%)	14(4.3%)	0.22
Neonatal mortality	5(1.3%)	12(3.7%)	0.03
NICU admission	40(9.5%)	65(20%)	0.0001
Cesarean delivery	67(16%)	53(16.4%)	0.82
Low birth weight	68(16.2%)	58(18%)	0.54

**DISCUSSION**

The present study shows underutilization of institutional maternal and neonatal health services and adverse perinatal outcome during the current COVID-19 pandemic. Monthly

reduction in the institutional deliveries was observed during this pandemic in our study. These findings co-relate other studies carried across various countries to study the effect of outbreak as COVID-19 on the health services. In a retrospective study done by Delamau et al in public health facilities in New Guinea showed institutional deliveries to have a significant decline during Ebola virus disease outbreak in 2014.<sup>8</sup> Similar findings were reported by Elston et al in Sierra Leone and John et al in rural Liberia during the Ebola outbreak.<sup>9,10</sup> Almost a 10% reduction in the complete ANC visits was observed in the current study during COVID-19 pandemic. A negative trend in ANC visit was also observed by Quaglio at al in a prospective observational study carried out across community health facilities and hospital during the peri Ebola period in Sierra Leone.<sup>11</sup> According to national protocol of Nepal, pregnant females are expected to receive at least four ANC visits. These visits are recommended to prevent, identify and reduce adverse maternal and neonatal outcome. Annual report 2074/2075 of Nepal showed the overall national level coverage of at least four ANC visits to be about 54%.<sup>12</sup> In the face of current pandemic, increasing the current ANC coverage remains quite a challenge.

Studies suggest the decline in utilization of health services could be attributed to various aspects: reduced health care visits due to fear of contracting the disease from health care facilities, mistrust on health care system, misconception of health care workers being the source of disease and reduced public movement and transport.<sup>13</sup> An indirect impact of the current pandemic on maternal and neonatal health in countries as Indonesia, India, Nigeria and Pakistan using Lives Saved Tool (LiST) estimate about 766 180 additional

deaths (31 980 maternal deaths, 395 440 newborn deaths, and 338 760 stillbirths) across these countries, which correspond to a 31% increase in mortality.<sup>14</sup> The findings were similar to that reported by Robertson et al in their modelling study using LiST across 118 low and middle income countries.<sup>7</sup>

The percentage of cesarean section in women reaching hospital was similar before and during pandemic in our study which was similar to observation made by Kim et al in West Africa during Ebola outbreak.<sup>15</sup> It could be due to our study being carried out in tertiary set up with most of the referrals being high risk cases.

There was increased proportion of preterm and low birth weight babies (LBW) delivered during COVID-19 pandemic in this study. The higher rate of LBW babies born to mothers during the current pandemic could be due to higher incidence of preterm births among mothers during this period. In a prospective observational study conducted by KC et al across nine hospitals in Nepal reported a significant increase in proportion of preterm births ( $p$ -value  $<0.001$ ) during COVID-19 lockdown period as compared to pre COVID-19 state.<sup>16</sup> The increased proportion of LBW babies might be attributed to ANC visits that was affected during the pandemic. Inadequate ANC visits is one of risk factors of LBW babies as established by various studies.<sup>17-19</sup> Preterm births increment might be associated with psychological distress such as anxiety or stress during pregnancy which might increase the risk for adverse birth outcomes, including preterm birth.<sup>20</sup> There was also a 10.5% increase in NICU admission rate during the present pandemic state in our study. The higher rate of preterm deliveries and LBW babies born during the current pandemic

might reflect the higher occurrence of neonatal admissions.

Regarding other adverse perinatal outcome, there was a significant increase in the incidence of neonatal mortality and still birth during COVID-19 pandemic in the present study. KC et al reported institutional neonatal mortality rate increasing from 13 per 1000 live births before COVID-19 lockdown to 40 per 1000 live births during lockdown.<sup>16</sup> Similarly in their study institutional stillbirth rate increased from 14 per 1000 total births before lockdown to 21 per 1000 total births during lockdown. Likewise, Jones et al reported facility-based stillbirth rate of 60.5 per 1000 births with an overall 24% increase in the incidence of stillbirth in Sierra Leone during Ebola epidemic.<sup>21</sup> The increase in mortality could be due to delay in reaching and seeking care associated with various aspects of pandemic. Reduced ANC visits might be the contributory factor to increased neonatal mortality and stillbirth. Increased incidence of LBW and preterm deliveries and increased neonatal morbidities requiring NICU admission contributing to rise in neonatal mortality in our study.

Regarding limitation of the study, this is a single tertiary care hospital based study thus might not reflect the scenario of the general population as a whole. Hence, further larger, multi institutional studies are required to address the limitation.

## CONCLUSION

The present study describes the trend of COVID 19 pandemic on maternal and neonatal health service utilization and outcome. The findings of decline in adequate ANC visits, institutional deliveries and adverse perinatal outcome as increased neonatal morbidity, mortality and still birth highlight the need to

maintain and strengthen uninterrupted maternal and neonatal health services during the current COVID-19 pandemic. There is also a need to develop and implement community based strategies to overcome the fear and mistrust of people on health care system supposing it as a source of infection in order

to restore health service utilization to pre COVID level.

**Acknowledgement:** We would like to acknowledge staff of maternity and neonatal ward for their co-operation for the completion of this study.

## REFERENCES

1. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Biomed.* 2020;91: 157. <https://doi.org/10.23750/abm.v91i1.9397> [PubMed]
2. World Health Organisation (WHO). Coronavirus disease (COVID-19) dashboard. [Assessed on 15th November 2020]. Available from: <https://covid19.who.int/>
3. WHO. Managing epidemics: key facts about major deadly diseases. [Assessed on 15<sup>th</sup> November, 2020]. Available from: <https://www.who.int/publications/i/item/managing-epidemics-key-facts-about-major-deadly-diseases>
4. Ministry of Health and Population (MOHP) [Nepal], New ERA, and ICF International Inc. 2017. Nepal Demographic and Health Survey 2016. Kathmandu, Nepal: Ministry of Health and Population, NewERA, and ICF International, Calverton, Maryland. [Assessed on 15<sup>th</sup> November, 2020] Available from: <https://www.dhsprogram.com/publication/publication-fr336-dhs-final-reports.cfm>
5. Elston JWT, Cartwright C, Ndumbi P, Wright J. The health impact of the 2014-15 Ebola outbreak. *Public Health* 2017;143:60–70. <https://doi.org/10.1016/j.puhe.2016.10.020> [PubMed]
6. Riley T, Sully E, Ahmed Z, Biddlecom A. Estimates of the potential impact of the COVID-19 pandemic on sexual and reproductive health in low- and middle-income countries. *Int Perspect Sex Reprod Health* 2020;46:73–76. <https://doi.org/10.1363/46e9020> [PubMed]
7. Robertson T, Carter ED, Chou VB, et al. Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study. *Lancet Glob Health* 2020;8:e901–08. [https://doi.org/10.1016/s2214-109x\(20\)30229-1](https://doi.org/10.1016/s2214-109x(20)30229-1) [PubMed]
8. Delamou A, Ayadi AME, Sidibe S, Delvaux T, Camara BS, Sandouno SD, Beavogui AH, Rutherford GW, Okumura J, Zhang WH, De Brouwere V. Effect of Ebola virus disease on maternal and child health services in Guinea: a retrospective observational cohort study. *Lancet Glob Health.* 2017;5(4):448–457. [https://doi.org/10.1016/s2214-109x\(17\)30078-5](https://doi.org/10.1016/s2214-109x(17)30078-5) [PubMed]
9. Elston JW, Moosa AJ, Moses F, Walker G, Dotta N, Waldman RJ, Wright J. Impact of the Ebola outbreak on health systems and population health in Sierra Leone. *J Public Health (Oxf).* 2016;38(4):673–678. <https://doi.org/10.1093/pubmed/fdv158> [PubMed]
10. Ly J, Sathananthan V, Griffiths T, Kanjee Z, Kenny A, Gordon N, Basu G, Battistoli D, Dorr L, Lorenzen B, Thomson DR, Waters A, Moore UG, Roberts R, Smith WL, Siedner MJ, Kraemer JD. Facility-Based Delivery during the Ebola Virus Disease Epidemic in Rural Liberia: Analysis from a Cross-

- Sectional, Population-Based Household Survey. *PLoS Med.* 2016;13(8):e1002096. <https://doi.org/10.1371/journal.pmed.1002096> [PubMed]
11. Quaglio G, Tognon F, Finos L, Bome D, Sesay S, Kebbie A, Di Gennaro F, Camara BS, Marotta C, Pisani V, Bangura Z, Pizzol D, Saracino A, Mazzucco W, Jones S, Putoto G. Impact of Ebola outbreak on reproductive health services in a rural district of Sierra Leone: a prospective observational study. *BMJ Open.* 2019;9(9):e029093. <https://doi.org/10.1136/bmjopen-2019-029093> [PubMed]
  12. Ministry of Health and population (MOHP) [Nepal]. Safe motherhood and neonatal health Department of Health Services, Annual Report 2074/75. [Assessed on 15<sup>th</sup> November 2020] Available from: <https://dohs.gov.np/annual-report-2074-75/>
  13. Chang HJ, Huang N, Lee CH, Hsu YJ, Hsieh CJ, Chou YJ. The impact of the SARS epidemic on the utilization of medical services: SARS and the fear of SARS. *Am J Public Health.* 2004;94(4):562-4. <https://doi.org/10.2105/ajph.94.4.562> [PubMed]
  14. Stein D, Ward K, Cantelmo C. Estimating the potential impact of COVID-19 on mothers and newborns in low-and middle-income countries. *Heal Policy Plus.* 2020.[[GoogleScholar](https://scholar.google.com/citations?user=8Y8Y8Y8Y8Y&hl=en)]
  15. Brolin Ribacke KJ, van Duinen AJ, Nordenstedt H, Höjjer J, Molnes R, Froseth TW, Koroma AP, Darj E, Bolkan HA, Ekström A. The Impact of the West Africa Ebola Outbreak on Obstetric Health Care in Sierra Leone. *PLoS One.* 2016;11(2):e0150080. <https://doi.org/10.1371/journal.pone.0150080> [PubMed]
  16. Kc A, Gurung R, Kinney MV, Sunny AK, Moinuddin M, Basnet O, Paudel P, Bhattarai P, Subedi K, Shrestha MP, Lawn JE, Målqvist M. Effect of the COVID-19 pandemic response on intrapartum care, stillbirth, and neonatal mortality outcomes in Nepal: a prospective observational study. *Lancet Glob Health.* 2020;8(10):e1273-e1281. [https://doi.org/10.1016/s2214-109x\(20\)30345-4](https://doi.org/10.1016/s2214-109x(20)30345-4) [PubMed]
  17. Mumbare SS, Maindarkar G, Darade R, Yenge S, Tolani MK, Patole K. Maternal risk factors associated with term low birth weight neonates: a matched-pair case control study. *Indian Pediatr.* 2012;49(1):25-8. <https://doi.org/10.1007/s13312-012-0010-z> [PubMed]
  18. Mavalankar DV, Gray RH, Trivedi CR. Risk factors for preterm and term low birthweight in Ahmedabad, India. *Int J Epidemiol.* 1992;21(2):263-72. <https://doi.org/10.1093/ije/21.2.263> [PubMed]
  19. Vega J, Sáez G, Smith M, Agurto M, Morris NM. Risk factors for low birth weight and intrauterine growth retardation in Santiago, Chile. *Rev Med Chil.* 1993;121(10):1210-9. [PubMed]
  20. Staneva A, Bogossian F, Pritchard M, Wittkowski A. The effects of maternal depression, anxiety, and perceived stress during pregnancy on preterm birth: A systematic review. *Women Birth.* 2015;28(3):179-93. <https://doi.org/10.1016/j.wombi.2015.02.003> [PubMed]
  21. Jones SA, Gopalakrishnan S, Ameh CA, White S, van den Broek NR. 'Women and babies are dying but not of Ebola': the effect of the Ebola virus epidemic on the availability, uptake and outcomes of maternal and newborn health services in Sierra Leone. *BMJ Glob Health.* 2016;1(3):e000065. <https://doi.org/10.1136/bmjgh-2016-000065> [PubMed]