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Perinatal outcomes of COVID-19 infection during pregnancy at three central hospitals (Mahosot, Mittaphap, and Mother and Newborn Hospital), in Vientiane Capital, Lao PDR

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ABSTRACT

Background: People who contract COVID-19 during pregnancy are at an increased risk for complications that can affect both their pregnancy and their developing baby.

Objective: This study aimed to identify perinatal outcomes of COVID-19 infection during pregnancy at three central hospitals (Mahosot, Mittaphap, and Mother and Newborn Hospital), in Vientiane Capital, Lao PDR.

Methods: This study was an analytical cross-sectional study. Purposive sampling was applied. The sample of this study consisted of 362 pregnant women who were infected with COVID-19 and gave birth in Mahosot, Mittaphap, and the Mother and New-born Hospital, Lao PDR as recorded in medical record books from 2019 to 2022. The data was collected using a data collection form designed by the researcher. SPSS version 25 was used to analyse the data. The multiple logistic regression was used to evaluate the association between the characteristics, their vaccinations, and perinatal.

Results: Among 362 pregnant women who were infected with COVID-19, the average age was 27.98 ± 5.71 years and 24.59% received COVID-19 vaccination. The percentage of babies with birth weight < 2500g was 14.60%. The percentage of babies with an APGAR score lower than 7 was 3.32%. The rate of babies admitted to the NICU was 4.14%. The fatal death rate was 1.38%. The antenatal care (ANC) visit was associated with baby weight after birth (Adjusted Odds Ratio (AOR) =1.04; 95% Confidence Interval (CI): 1.42,5.60). The body mass index (BMI) was associated with APGAR score (AOR=1.56; 95% CI 1.30,17.41).

Conclusion: There are some concerns regarding perinatal outcomes such as low birth weight, low APGAR score, babies being admitted to the NICU, and some instances of fatal death. The high frequency of ANC visit and well control of BMI was associated with the positive impact of perinatal outcomes.

Keywords: COVID-19 during pregnancy, Lao PDR

1. Introduction

Pregnant women who are infected with COVID-19 are at risk of severe respiratory symptoms and impacts on pregnancy outcomes [1]. People who contract COVID-19 during pregnancy are also at an increased risk for complications that can affect their pregnancy and developing baby. For example, COVID-19 during pregnancy increases the risk of delivering a preterm (earlier than 37 weeks) and/or a stillborn infant [2]. A meta-systematic review of three studies (348 COVID-19 infected pregnancies and 1376 COVID-19 non-infected pregnancies) did not change the fatal death intrauterine rate in the compared group (pooled OR 1.79 [95% CI 0.51-6.23]; p = 0.36; I2 = 68%), Preterm birth (OR 1.8[95% CI 1.34-2.58]), Low birth weight (OR 1.69[95% CI 1.35-2.11]), 5th minute APGAR score < 7 (OR 1.44[95% CI 1.11-1.86]), Neonatal death (OR 1.73[95% CI 0.63-5.00]), Admissions to NICU (OR 2.12[95% CI 1.36-3.32]), Stillbirth (OR 1.46 [95% CI 1.46-1.85]) [3]. In Lao PDR, there have also been reports of the number of COVID-19 infections during pregnancy. The statistical report from Aug 2021 to June 2022 from the Mother and Newborn Hospital in Vientiane Capital, Lao PDR showed that there was a total of 282 cases [4]. The report from Mahosot Hospital showed 66 cases from June 2021 to August 2022 [5], and the report from Mittaphap Hospital from 2019 to 2022 showed 175 cases [6]. However, there has no study on perinatal outcomes of COVID-19 infection during pregnancy in Lao PDR. Thus, this study aims to study the perinatal outcomes of COVID-19 infection during pregnancy at three central hospitals (Mahosot, Mittaphap, and Mother and Newborn Hospital), in Vientiane Capital, Lao PDR.

2. Methods

2.1 Study Area

This study was included all pregnant women who were infected with COVID-19 and gave birth in the following hospitals: Mahosot, Mittaphap, and the Mother and New-born Hospital. These cases were recorded in medical record books from 2019 to 2022.

2.2 Study Design

This study was an analytical cross-sectional study.

2.3 Sample Size and Sampling

The participants were pregnant women who were infected with COVID-19 and gave birth

in the following hospitals: Mahosot, Mittaphap, and the Mother and New-born Hospital during 2019-2022.

Inclusion Criteria: All the completed data of registered pregnant women who infected COVID-19 with completed data of perinatal outcomes which were recorded in yearly book report of three central hospitals.

Exclusion criteria: The registered pregnant women who infected COVID-19 with missing records of perinatal outcomes.

The total number of cases recorded in yearly report book from the three central hospitals was 523. However, only 362 records provided full information and were analysed.

2.4 Data Collection

The tool used in this study was a data collection form designed by the researcher based on literature review. Electronic data were collected using KoboToolBox.

2.5 Data Analysis

The data was analysed using SPSS version 25. Descriptive statistics were used to describe the percentage, maximum, median, mean, and standard deviation of general characteristics. The multiple logistic regression was used to evaluate the association between the characteristics of pregnant women infected with COVID-19, their vaccinations, and perinatal outcomes (preterm birth, low birth weight below 2500g after birth, fatal death, admission to NICU, APGAR score<7).

3. Results

Among 362 pregnant women who were infected with COVID-19 across three hospitals (Mittaphap 175, Mother and Newborn 135, Mahosot 52), the average age is 27.98 ± 5.71 years. In 88.12% of cases, their body temperature (BT) is mostly above 37.5 degrees Celsius. The COVID-19 vaccination rate is 24.59%. The rate of full-term pregnancies is 83.43%. The percentage of babies with birth weight lower than 2500g is 14.60%. The percentage of babies with APGAR score lower than 7 is 3.32%. The rate of babies admitted to the NICU is 4.14%. The fatal death rate is 1.38%, as shown in Table 1.

Table 1: General characteristics of pregnant women who infected COVID-19 (n=362)

Variables	Pregnant women who infected COVID-19	
	Frequency	Percentage
Age (Year)		
< 35	240	66.3
≥ 35	122	33.7
Mean±SD	27.98± 5.71	

Variables	Pregnant women who infected COVID-19	
	Frequency	Percentage
SBP (mmHg) (Mean±SD)	119.86±2.05	
DBP (mmHg) (Mean±SD)	79.63±3.67	
Body temperature (degree Celsius)) (Mean±SD)	38.34±0.67	
Time to visit ANC		
≥ 7	290	80.1
< 7	72	19.9
Mean±SD	6.79±**0. 06**	
Respiratory Rate (time) (Mean±SD)	20.19±1.18	
Pulse Rate (time) (Mean±SD)	79.95±3.30	
BMI (m/kg2)		
< 23	325	89.8
≥ 23	37	10.2
Mean±SD	22.88±0.22	
Gravida		
≤ 2	265	73.2
>2	97	26.8
Parity		
≤ 2	313	86.5
> 2	49	13.5
A (Abortion)		
≤ 2	329	90.9
> 2	33	9.1
Live birth		
≤ 2	315	87
> 2	47	13
COVID-19 vaccination rate		
No	273	75.41
Yes	89	24.59
Fatal birth method		
Vaginal delivery (VD)	272	75.14
Caesarean section (CS)	90	24.86
Perinatal outcomes		
Preterm birth		
< 38 weeks	18	4.97
≥ 38 weeks	344	95.03
Baby weight after birth		
< 2500g	53	14.60
≥ 2500g	309	85.40
APGAR Score		
< 7	12	3.32
≥ 7	349	96.68
NICU admission		
No	347	95.86
Yes	15	4.14
Fatal death		
No	357	98.62
Yes	5	1.38

There is no association between preterm birth and fatal death. The antenatal care (ANC) visit was significantly associated with baby weight after birth (Adjusted Odds Ratio (AOR) =1.04; 95% Confidence Interval (CI): 1.42-5.60, P-value<0.005). The body mass index (BMI) was significantly associated with APGAR score (AOR=1.56; 95% CI: 1.30-17.41, P-value<0.004), as shown in Table 2.

Table 2: The association between pregnant women who infected COVID-19 and perinatal outcomes (n=362)

Variables	Crude OR	Crude OR (95% CI)	Adj. OR	(95% CI)	P-value
1.Baby weight after birth (≥ 2500g)					0.005
ANC visit	1.89*	1.28-4.61	1.04*	1.42-5.60	
2.NICU admission					0.198
BMI	1.24*	1.04-11.48	1.21	0.98-11.63	
3. APGAR Score (<7)					0.004
BMI	1.57*	1.37-16.76	1.56*	1.30-17.41	

Note: COR= Crude Odds Ratio, AOR= Adjusted Odds Ratio, * Statistically significant P-value<0.05

4. Discussion

A total of 362 pregnant women infected with COVID-19 were analysed in this study. COVID-19 vaccination rate was low (24.59%). There concerns regarding perinatal outcomes in pregnant women infected with COVID-19 were low birth weight, low APGAR score, NICU admissions, and some instances of fatal death. The significant results where P-value<0.05 were identified between certain characteristics of pregnant women infected with COVID-19 and perinatal outcomes such as the number of ANC visits and low birth weight, BMI and APGRA score.

The previous systematic review and meta-analysis study of Pathirathna et al, 2022 found that the fatal death rate was not different compared with non-infected pregnant women [3]. This study found 0.28% rate of fatal death and a preterm birth rate of 3.59%, while another study found 61.1% [7]. The low birth weight (below 2500g) in this study was 14.60%, while another study found 42.8% [7]. This study found a 4.14% rate of NICU admission, while another study found 42.8% [7]. A previous study found a low APGAR score (lower than 7) [3], as did this study, which found a 3.32% rate of low APGAR score.

Regarding the perinatal outcomes in this study which found a few severity outcomes of the neonatal, in the previous systematic review also reported that in eighteen articles reporting data from 108 pregnancies between 8 December 2019 and 1 April 2020 were

included in the current study, there are three maternal intensive care unit admissions were noted but no maternal deaths. One neonatal death and one intrauterine death were also reported [8]. However, in a retrospective cohort study found that among 26,827 singleton deliveries, 563 women had peripartum COVID-19, associated with preterm deliveries both near-term and remote from term [adjusted odds ratio (aOR) 1.6 and 2.0, respectively, P = 0.007 and 0.003]. Women with peripartum COVID-19 had a significantly higher rate of disseminated intravascular coagulation (DIC) (aOR 23.0, P = 0.001). Conversely, peripartum COVID-19 peripartum COVID-19 was negatively associated with premature rupture of membranes and prolonged maternal length of stay (aOR 0.7 and 0.5, respectively, P = 0.006 and <0.001) [9]. The Canadian surveillance study included 6012 completed pregnancies between March 2020 and October 2021, among cases of infection during pregnancy compared with pregnant individuals without COVID-19 infection, there was a significantly increased risk of preterm birth (relative risk, 1.63) [10]. This study also found 3.59% preterm birth. The result of the meta-analysis of *Simbar, M, 2023* showed that the pooled prevalence of preterm delivery, maternal mortality, NICU admission and neonatal death in the group with COVID-19 infection was significantly more than those without COVID-19 infection (P<0.01) [11]. This study is focus only in COVID-19 infection and in those found the number of antenatal care visit was significantly associated with baby weight after birth in both crude odds ratio and adjusted odds ratio which mean after adjusting the number of ANC visit with other factors still remain 2.82 times more likely to associated with normal birth weight (>2500g). Other significantly associated with perinatal outcomes in this study was the body mass index with APGAR score in both crude odds ratio and adjusted odds ratio which mean after adjusting BMI with other factors still remain 4.77 times more likely to associated with normal APGAR score (>7). Both factors (ANC visit and BMI) indicated that the pregnant women who infected COVID-19 who came to visit ANC frequency (more than 7 times during pregnancy) might help them to prevent the low birth weight of the baby and also the well control of BMI (<23) might associate with normal APGAR score of the baby. The previous study showed that pregnant women with high BMI is considered as high-risk pregnancy which had negative impact to perinatal outcomes [12]. It was obvious that

COVID-19 infection was associated with severe perinatal outcomes as shown in several studies that are mentioned above. This study revealed ANC visit and BMI had positive impact on perinatal outcomes. Therefore, the pregnant women with COVID-19 infection should receive adequate ANC and maintain healthy BMI.

This study has some limitations. First, the type of COVID-19 vaccines was not reported due to limitations in data access. Future studies should investigate the types of vaccines used. Second, the data was not completely collected as the number of COVID-19 infected women shown in the yearly report of the hospitals and missing of information on COVID-19 severity, variant types, and timing of infection during pregnancy. This was due to the loss of some hospital record books, suggesting that the hospital system should consider implementing a better data recording system in the future. Finally, this study had no control group which need more further study to see more impact of COVID-19 to pregnant women.

5. Conclusion

The perinatal outcomes among pregnant women infected with COVID-19 includes low birth weight, low APGAR score, babies being admitted to the NICU, and some instances of fatal death. Regular ANC visits and well control of BMI was associated with the positive impact of perinatal outcomes.

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Author contributions

SC: Conceptualization, data curation, formal analysis, methodology, writing original draft, writing review and editing. PS: Conceptualization, methodology, writing original draft, writing review and editing. AP: Conceptualization, methodology, supervision, writing original draft, writing review and editing.

Declaration

Ethics approval and consent to participate

This study has approval by Ethical Research Committee of the University of Health Sciences, Lao PDR, number 516/REC, 2023.

Competing interests

No competing interests

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