



The Correlation Between Human Immunodeficiency Virus (HIV) Infections in Pregnancy and Low Birth Weight Infants

Muhammad Ali Shodikin¹, Inke Kusumastuti¹, Wahidah Nur Indasyah¹

¹Faculty of Medicine, University of Jember, East Java, Indonesia

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CORRESPONDENCE

E-mail: alipspd@unej.ac.id

A B S T R A C T

The prevalence of Human Immunodeficiency Virus (HIV) infection in pregnancy increases in developing countries. The disease interferes with nutrient absorption due to the accumulation of inflammatory cells in the placenta, causing infants with low birth weight. This study investigates the correlation between HIV infections in pregnancy and low birth weight infants. This paper was an analytic observational study with a retrospective approach. The population were positive and negative HIV pregnant mothers in the Obstetrics and Gynecology ward and their infants in the Neonatology ward at dr. Soebandi Hospital from August 2014 to July 2017. There were 52 samples of HIV-positive pregnant mothers by total sampling, while 52 samples of HIV-negative pregnant mothers by purposive sampling. The independent variable was the pregnant mother's HIV Status, while the dependent variable was infant birth weight. The data analysis used the Fisher's Exact with a 95% confidence interval and a significance of $p < 0.05$. In the HIV-positive pregnant mothers, nine of 52 respondents (17.3%) were LBW infants. Meanwhile, in the HIV-negative pregnant mother group, three of 52 respondents (5.8%) were LBW infants. The data analysis by Fisher's Exact obtained $p = 0.06$ ($p > 0.05$). This study concludes that there is no significant correlation between HIV infections in pregnancy and low birth weight infants. Although, the incidence of LBW in HIV-positive pregnant mothers is three times more than in HIV-negative pregnant mothers.

INTRODUCTION

Normal birth weight (NBW) is an infant with a birth weight of 2500-4000 grams. Meanwhile, low birth weight (LBW) is an infant with under 2500 grams (World Health Organization, 2011). More than 20 million infants were born with LBW worldwide, and 95.6% were born in developing countries (World Health Organization, 2011). The prevalence of LBW in Indonesia is relatively high at 6.2% (Kemenkes RI 2018). East Java Provincial Department of Health (2019) stated that 24.2% of neonatal deaths were caused by LBW. In addition, Suparmi *et al.* (2016) reported that LBW infants risk death 9.8 times greater than NBW infants.

The number of new Human Immunodeficiency Virus (HIV) cases in the housewife group is still increasing. A previous study revealed that HIV-positive pregnant mothers were four times more at risk of amniotic membrane inflammation. The inflammation caused preterm birth, small for gestational age (SGA), and LBW (Ategeka *et al.* 2019). Term LBW can be caused by several factors, including pregnancy type, maternal age, haemoglobin level, iron, folic acid, and HIV status (Gebregzabihherher *et al.*

2017).

Dr. Soebandi Hospital Jember is one of the referral hospitals for pregnant mothers with HIV in East Java-Indonesia. There are still few studies of the correlation between HIV infection in pregnancy and birth outcomes in Indonesia. Therefore, this study investigates the correlation between HIV infection in pregnancy and low birth weight (LBW) infants.

METHOD

Ethical Commission in Faculty of Medicine, University of Jember approved the ethical clearance of this study (No. 1.357/H25.1.11/KE/2020). This paper was an analytic observational study with a retrospective approach. The population were positive and negative HIV pregnant mothers in the Obstetrics and Gynaecology ward and their infants in the Neonatology ward at dr. Soebandi Hospital from August 2014 to July 2017. There were 52 samples of HIV-positive pregnant mothers by total sampling. Meanwhile, the population of the HIV-negative pregnant mother group was 10,372 patients, so the authors selected a sample close to the characteristics of HIV-positive pregnant mothers. Thus, there were 52 samples of HIV-negative pregnant mothers by purposive sampling. The independent variable was the pregnant mother's HIV Status, while the dependent variable was infant birth weight. The data analysis to determine the correlation between independent and dependent variables using the Fisher's Exact with a 95% confidence interval and a significance of $p < 0.05$ because the data did not meet the Chi-Square requirements.

RESULT

In this study, the characteristics of pregnant mothers consisted of maternal age, parity, gestational age, and impaired placental function. Both HIV-positive and HIV-negative pregnant mothers were aged 20-35 years old, had parity status less than equal to three times, and had gestational age at term. In addition, the majority of pregnant women in both groups were without placental dysfunction. The characteristics of pregnant mothers could be seen in Table 1 in detail.

Table 1. The characteristics of pregnant mothers

Characteristics	Pregnant mother's HIV Status	
	HIV positive (n)	HIV negative (n)
Maternal age (years old)		
<20 or >35	7	8
20-35	45	44
Parity status		
>three times	1	3
≤three times	51	49
Gestational Age		
<37 weeks	19	15
≥37 weeks	33	37
Placenta dysfunction		

Yes	18	15
No	34	37

The correlation of HIV infection in pregnancy and low birth weight infants were shown in Table 2. In the HIV-positive pregnant mothers, nine of 52 respondents (17.3%) were LBW infants. Meanwhile, in the HIV-negative pregnant mother group, three of 52 respondents (5.8%) were LBW infants. The data analysis by Fisher's Exact obtained $p=0.06$ ($p>0.05$) with $OR=3.42$. Statistically, there was no significant correlation between HIV infections in pregnancy and low birth weight infants.

Table 2. Correlation between HIV infection in pregnancy and low birth weight infants

Pregnant mother's HIV Status	Infant birth weight				p	Odds Ratio (95% CI)
	LBW (<2500 grams)		NBW (≥2500 - 4000 grams)			
	N	%	N	%		
HIV-positive	9	17.3	43	82.7	0.06	3.42
HIV-negative	3	5.8	49	94.2		(0.87-13.4)

DISCUSSION

This paper found that most of the birth outcomes in HIV-positive pregnant mothers had normal birth weight (82.7%). A study by Twabi *et al.* (2020) stated that HIV-positive mothers delivered infants with higher birth weight after intervention with the prevention mother to child transmission (PMTCT) program. On the other hand, other studies contrarily showed that the birth weight in infants was affected by maternal HIV infection status (Xiao *et al.* 2015); (M. Salihu *et al.* 2012).

However, this paper found that the incidence of LBW in HIV-positive pregnant mothers was three times (17.3%) more than in HIV-negative pregnant mothers (5.8%). It is in line with a study conducted by (Offspring, Msamila, and Msamila 2018). The study showed that HIV-positive pregnant mothers had a 77% risk of giving birth to LBW infants compared to HIV-negative pregnant mothers. The LBW infants in HIV-positive pregnant mothers can be caused by placenta inflammation due to infection disrupting placental function. Kumar *et al.*, (2011) reported that HIV-1 could replicate in the placenta, and Akoto *et al.* (2021) also revealed that HIV-1 infection could change the profile of cytokines in the placenta. Both can affect placental function during pregnancy and then limit fetal development, thus resulting in LBW.

M. Salihu *et al.*, (2012) also showed that infants born to mothers with HIV infection had an average birth weight lighter (303 grams) than infants born to mothers without HIV infection. This study almost had the same result; HIV-positive pregnant mothers had an average infant birth weight lighter (178 grams) than HIV-negative pregnant mothers. In addition, Kim *et al.*, (2012) reported that women with CD4 cell counts <350 cells/mm³ were more likely to deliver LBW infants than women with higher CD4 cell counts. Sofeu *et al.* (2014) also found that maternal HIV infection is significantly associated with small for gestational age (SGA) and gender infants.

The data analysis using Fisher's Exact showed no significant correlation between HIV infection in pregnancy and low birth weight infant at dr. Soebandi Hospital ($p=0.06$). Some factors that might affect those results include: the mother's young age; good maternal nutrition status; newly infected by HIV, so they do not have opportunistic infections; successful early antiretroviral treatment; most respondents do not experience dysfunctional placenta; and has parity less than three times

CONCLUSIONS

This study concludes that there is no significant correlation between HIV infections in pregnancy and low birth weight infants. Although, the incidence of LBW in HIV-positive pregnant mothers is three times more than in HIV-negative pregnant mothers.

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