LOW BIRTH WEIGHT INFANTS BORN TO HIV-SEROPOSITIVE MOTHERS AND HIV-SERONEGATIVE MOTHERS IN CHIANG RAI, THAILAND

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Abstract. The low birth weight (LBW) infant has a much higher risk of mortality and morbidity in infancy and early childhood. This study examined the effects of maternal HIV infection and other risk factors for LBW (<2,500 g). A retrospective study of mothers who delivered at Mae Chan Hospital from 1997 to 2002 was conducted. Logistic regression was used to adjust for confounding factors. There were 266 infants born to HIV-seropositive mothers and 5,872 infants born to HIV-negative mothers. Low birth weight was significantly associated with maternal HIV status, gestational age, antenatal care, maternal age less than 20 years, and >35 years. Maternal HIV positive status, young maternal age and gestational age were significant factors after adjusting for potential confounders. No significant effect of hilltribe on LBW was found. The results underline the need for nutritional surveillance and dietary counseling. HIV-seropositive women must receive early and continuing antenatal care for good pregnancy outcomes.

INTRODUCTION

Low birth weight infants are at higher risk of mortality and morbidity than infants with normal weight at birth (Bakketeig *et al*, 2006). Studies in Tanzania, Kenya, Rwanda, and Zambia found HIV-1 infection was associated with adverse pregnancy outcomes of low birth weight (LBW), prematurity and intrauterine growth retardation (Dreyfuss *et al,* 2001; Villamor *et al,* 2003; Van Eijk *et al*, 2004a). HIV-infected women with lower CD4 count are particularly prone to have LBW infants (Goldstein *et al*, 2000). There was also a significantly higher risk of low birth weight and prematurity among symptomatic HIV-infected women (Coley *et al,* 2003). HIV-infected women are more likely to deliver LBW infants due to inadequate maternal weight and maternal anemia (Scarlatti 1996; Kennedy *et al,* 2001).

Little is known about the association between LBW infants and HIV seropositive mothers in Thailand. In 2005 the prevalence of LBW in northern Thailand was 9.49% (Dangpioum *et al*, 2001). HIV infection among pregnant women in Chiang Rai is estimated to be 1.28% (Chiang Rai Provincial Health Office, 2005). Since the risk of HIV mother to child transmission increases for a LBW baby (Ickovics *et al*, 2000; Kreitchmann *et al*, 2004) it is useful to know the Thai situation, whether an association between HIV positive mothers and LBW infants exists. An appropriate intervention program might reduce the LBW rate. This could result in a reduction in mortality and morbidity in infants and preschool children (Turner *et al*, 2000; Newschaffer *et al,* 1998).

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This study investigated the effects of maternal HIV status and low birth weight, by controlling for potential confounding factors, including the socio-demographics of the mother and the health care service provided to them. The information obtained could be used to modify practical guidelines for prenatal care clinics and special clinics for HIV-seropositive mothers.

MATERIALS AND METHODS

This retrospective study was conducted at Mae Chan Community Hospital, Chiang Rai Province, Thailand. The province is an HIV epidemic area and health care services are provided to the Thai and hilltribe populations. All children born between January 1, 1997 and December 31, 2002 were included in the study. The study subjects were 266 singleton live-born infants of HIV-infected mothers and 5,872 singleton live-born infants of HIV-uninfected mothers. The date coincided with the initial period of antiretroviral treatment in a maternal to child transmission prevention program launched in the area. Only live-born twin infants were excluded from this analysis. The data were recorded from documents of the delivery room and included sociodemographic information, pregnancy histories, infant body weight, body length, and head circumference. Maternal HIV-infection was test by ELISA (The Enzyme-Linked ImmunoSorbent Assay) and the Western blot was used for confirmation. The protocol was approved by the ethics committee of the Ministry of Public Health (MOPH) and ethics committee of Khon Kaen University.

Statistical analysis

Sociodemographic factors considered in the analysis included maternal age, gender of infant, ethnicity, parity, gestational age, prenatal care, and laboratory studies during pregnancy. Low birth weight was defined as birth weight < 2,500 g, and preterm as a gestation age <37 weeks. The chi-square test was used to compare the characteristics (categorical variable) of the HIV-seropositive mothers and HIV-seronegative mothers. The factors considered to relate to low birth weight were examined by univariate analysis. A p-value < 0.2 was used for the initial logistic regression model. A backward selection strategy was used for logistic regression and non-significant variables were taken out one-by one in order to fit the final model. The logistic regression model were used to estimate the relative odds of LBW after adjusting for potential confounding factors. Stratified analysis was conducted and adjusted logistic regression with interaction terms was performed.

RESULTS

Information about the socio-economic situation as well as the demographics and obstetric characteristics of HIV-seropositive and HIV-seronegative mothers and their newborns is given in Table 1. Of 6,138 pregnancies investigated, less than 8% resulted in infants with LBW. The proportion of LBW infants born to HIV-positive mothers was higher (12.0%) than infants born to HIV-negative mothers (7.1%).

HIV-seropositive mothers did not differ significantly from HIV-seronegative mothers in terms of maternal age and gestational age. The proportions of males and females was similar in both groups. The proportion of deliveries from hill tribe mothers was about 10% less in comparison to ethnic Thai mothers. The rates of HBsAg and VDRL infection among the HIV-seropositive and HIV-negative groups were similar. Both groups of mothers were similar in the number of previous pregnancies. The percentage of mothers with anemia was higher in HIV-seropositive mothers (35.1%) than HIV-seronegative mothers (17.7%). More than 80% of pregnancies had received complete antenatal care (ANC), of 4 times in 3

Table 1
Baseline characteristics of infants.

Characteristics	HIV +ve mothers *n* = 266(%)	HIV-ve mothers *n* = 5,872(%)	Total *n* = 6,138(%)
Birth weight (grams)			
< 2,500	32 (12.0)	419 (7.1)	451 (7.3)
2,500-3,000	111 (41.7)	2,238 (38.1)	2,349 (38.3)
> 3,000	123 (46.2)	3,215 (54.7)	3,338 (54.4)
Sex of infant			
Male	147 (55.7)	2,967 (50.6)	3,114 (50.8)
Female	117 (44.3)	2,897 (49.4)	3,014 (49.2)
Maternal Age (years)			
< 20	27 (10.1)	1,092 (18.6)[a]	1,119 (18.2)
20-35	228 (85.7)	4,375 (74.5)[a]	4,603 (75.0)
> 35	11 (4.1)	405 (6.9)	416 (6.8)
Ethnicity			
Thai	156 (59.5)	3,213 (56.4)	3,369 (56.6)
Hill-tribe	106 (40.5)	2,479 (43.5)	2,585 (43.4)
Previous pregnancies			
G1	93 (41.3)	2,035 (39.1)	2,128 (39.2)
G2	80 (35.6)	1,847 (35.5)	1,927 (35.5)
G3	35 (15.6)	745 (14.3)	780 (14.4)
≥ G4	17 (7.6)	580 (11.1)	597 (11.0)
Maternal HBsAg infection			
Yes	17 (8.2)	265 (5.1)[a]	282 (5.2)
No	189 (91.7)	4,922 (94.9)	5,111 (94.8)
Maternal VDRL infection			
Yes	5 (2.1)	6 (0.1)[a]	11 (0.2)
No	237 (97.9)	5,735 (99.9)[a]	5,972 (99.8)
Maternal hematocrit			
< 33 mg %	26 (35.1)	447 (17.7)[a]	473 (18.2)
≥ 33 mg %	48 (64.9)	2,078 (82.3)[a]	2,126 (81.8)
Place of ANC			
Hospital	10 (18.9)	197 (13.5)	207 (13.7)
Primary care Unit	43 (81.1)	1,258 (86.5)	1,301 (86.3)
ANC			
Complete	186 (72.9)	4,853 (83.8)[a]	5,039 (83.3)
Incomplete	64 (25.1)	870 (15.0)[a]	934 (15.5)
No ANC	5 (2.0)	69 (1.2)[a]	74 (1.2)
Number of ANC visits			
< 4	24 (13.6)	522 (12.0)	546 (12.0)
4-8	73 (41.2)	2,196 (50.3)	2,269 (50.0)
> 8	80 (45.2)	1,651 (37.8)[a]	1,731 (38.1)
Gestational age (weeks)			
< 37	21 (8.5)	386 (7.0)	407 (7.1)
37-40	207 (83.8)	4,465 (81.4)	4,672 (81.5)
> 40	19 (7.7)	637 (11.6)	656 (11.4)

[a]Significant difference by chi-square test, ANC = antenatal care, HIV = human immunodeficiency virus, VDRL = Venereal disease research laboratory, HBsAg = Hepatitis B virus surface antigen.

Table 2
Multivariate adjusted analysis of factors that effect low birth weight.

Factors	Number	LBW (%)	Crude OR	Adjusted OR	95 % CI	p-value
Maternal HIV status						
Positive	266	12.0	1.78	1.98	1.26-3.10	<0.01
Negative	5872	7.1	1.00			
Gender of child						
Male	3403	7.1	1.00			
Female	3300	8.0	1.14	0.13	0.93-1.44	0.199
Maternal age (year)						
< 20	1224	8.7	1.26	2.34	1.62-3.37	<0.001
20-35	473	7.0	1.00			
> 35	5018	11.4	1.71	1.26	0.95-1.66	0.325
Gestational age (week)						
< 37	445	43.2	15.84	12.81	8.46-19.39	<0.001
37-40	700	4.6	1.00			
> 40	5054	4.6	1.01	0.87	0.59-1.26	0.499
ANC						
Complete	5258	6.8	1.00			
Incomplete	1186	9.6	1.46	1.34	0.96-1.86	0.081
No ANC	129	14.0	2.23	1.60	0.65-3.94	0.302

ANC= antenatal care, LBW= low birth weight, OR = odds ratio, CI = confidence interval.

trimesters, at primary care units. That means HIV-seropositive mothers were more likely to have completed antenatal care. Infants born to HIV-seropositive mothers were more likely to be premature at birth. The results of univariate analysis found LBW was associated with positive maternal HIV status, gestational age <37 weeks, maternal age <20 years, maternal age >35 years, no ANC, and ANC incomplete.

The results of logistic regression are shown in Table 2. After adjusting for all confounding variable on the logistic regression model, maternal HIV status, maternal age < 20 years and gestational age < 37 weeks remained as risk factors for LBW.

DISCUSSION

It was found that HIV infection contributed to LBW among HIV seropositive pregnant women in northern Thailand. This is consistent with the findings from other countries (Van *et al*, 2004a,b; Temmerman *et al*, 1994; Ryder, 1991). The relation between HIV infection and LBW may be due to frequent or chronic infections in pregnant HIV positive women suffering from immunosuppression. Often HIV positive women are stigmatized, when results in a lack of support from her social environment which may effect her nutritional status, including iron and vitamin A deficiency. (Newschaffer *et al*, 1998; Kennedy *et al*, 2001; Ayisi *et al*, 2000). These factors may contribute to the occurrence of LBW in the infants of these women and may also increase the transmission of the disease to their offspring (Lee, 1998). Opportunistic infections should be treated; counseling and psychological support should also be provided during pregnancy.

Maternal age <20 years is an important risk factor for LBW and might be seen as an

effect modifier in this study. A trend toward increased risk for LBW may be attributed to anemia, hepatitis B infection, syphilis infection, and belonging to the hill tribe ethnic group, but this could not be confirmed by descriptive statistics. A drawback of this investigation was that it was not possible to assess for potential confounders, such as the stage of HIV disease, maternal nutritional status, smoking, alcohol consumption and drug abuse, because these variables were not included in the database.

To reduce the risk of HIV-seropositive women for having children with a LBW it is recommended they should participate early in pregnancy in antenatal care programs. HIV-infected women need to be evaluated nutritionally and be given dietary counseling. All HIV-infected pregnant women should have access to antiretroviral therapy (ARV) through the government. Guidelines for antenatal care in HIV-seropositive pregnancies should be made to include these suggestions.

ACKNOWLEDGEMENTS

The authors would like to thank the team of nurses, supervisors, and staff of the delivery room at Mae Chan Hospital and would also like to thank the field staff and statistician of the TB/HIV Research Project, Chiang Rai. who made this work possible. We would also like to thank Dr Thepnareumit Matanawin, Director of Chiang Rai Provincial Health Office, and Dr Surachai Piyaworawong, Director of Mae Chan Hospital, for their institutional support. The authors would like to thank Dr Jeff Johns, Faculty of Pharmaceutical of Khon Kean University for English editing. This work was supported by KAKENHI, Grant-in-AIDS for Scientific Research (A), from Japan Society for the Promotion of Science (JSPS).

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