The Association between Low Birth Weight and Antenatal Care in Pregnant Women with Hepatitis B at Primary Health Centres, Medan City

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Abstract

Background: Hepatitis B is a viral infection that attacks the liver and can cause acute or chronic disease, with the main transmission being vertical from mother to child. Infection in newborns is at high risk of becoming chronic up to 95%. The prevalence of Hepatitis B in pregnant women in Indonesia is around 1,5% while in other regions it ranges from 0,7–7%. Pregnant women who are HBsAg positive are at risk of giving birth to low birth weight (LBW) babies, which contributes to neonatal mortality and stunting. Indonesia is targeting the elimination of Hepatitis B by 2030 with early detection through HBsAg screening during antenatal care (ANC) visits and vertical transmission prevention measures.

Method: This study used a cross-sectional observational design with an analytical survey approach, involving 120 pregnant women who underwent ANC and HBsAg examinations at 41 Medan city Primary Health Center in 2023. Data were obtained from medical records and analyzed using the Chi-square test and Fisher's Exact Test.

Results: The variables of Hepatitis B, blood pressure, Mid-upper arm circumference size, and hemoglobin levels did not show a statistically significant relationship with the incidence of LBW (respectively p values of 1,000; 1,000; 0,094; and 0,682). Factors that were significantly related to the incidence of LBW were compliance with ANC visits (p=0,001).

Conclusion: There was no relationship between pregnant women with Hepatitis B and the incidence of LBW. However, in this study, the role of ANC is an important factor in the occurrence of LBW.

Keywords: Hepatitis B in pregnancy, LBW, ANC visits, maternal health services

1. Introduction

Hepatitis B is a viral infection that attacks the liver and can develop into chronic conditions such as cirrhosis and liver cancer. Transmission in Indonesia generally occurs vertically from mother to child during perinatal, with the risk of becoming chronic reaching 95% [1,2]. Globally, Hepatitis B caused 83% of the 1,3 million hepatitis deaths in 2022 [3].In Southeast Asia, there are around 60 million Hepatitis B sufferers, and in Indonesia an estimated 51.100 deaths occur each year due to Hepatitis B [4].

The prevalence of Hepatitis B in pregnant women varies: 0,7–0,9% in the US [5],7% in China [6],0,9% of Syrian refugees [7],1,1% in Turkiye [7], 6,77% in Africa [8],5,78% in Ethiopia [9], 6% in East Africa [10],1,5% in Indonesia [11], and 0,87% in Medan City [12]. Hepatitis B infection during pregnancy increases the risk of low birth weight (LBW), vertical transmission, and neonatal complications [13]. LBW is a serious problem, with around 20 million cases per year globally and contributing to neonatal mortality and stunting later in life [14]. Early detection of Hepatitis B in pregnant women through HBsAg laboratory tests with RDT rapid test tools integrated with antenatal care (ANC) [1].

In response to this, it is important to conduct research to examine in depth the relationship between pregnant women with Hepatitis B and the incidence of LBW. This research can provide a local picture of the impact of this infection on pregnancy and provide a basis for further intervention. By supporting the Hepatitis B elimination strategy by WHO and SDGs 2030, this study is expected to contribute to strengthening the screening program and early treatment of Hepatitis B infection in primary health care facilities. This study aims to analyze relationship between Pregnant women Hepatitis B and ANC examination against the occurrence of LBW at the Medan Primary Health Center in 2023 with the hope of contributing to clinical practice and public health policy in addressing this double burden of disease more effectively.

2. Research methods

2.1. Research Design

This study is an observational study with a cross-sectional approach using an analytical survey, aiming to determine the relationship between pregnant women with Hepatitis B and the incidence of LBW in 2023. The population in this study were all pregnant women who underwent ANC examinations and HBsAg tests at 41 Medan Primary Health Center during 2023 totaling 7.040 people. The sample was determined based on the Slovin formula with an anticipated dropout of 20%, so the number of samples was set at 120 people. Sample selection was carried out purposively based on inclusion and exclusion criteria.

2.2 Inclusion and Exclusion Criteria

The research subjects included were pregnant women with complete medical records and include information needed for research and residence in the city of Medan.

2.3 Data Collection

Secondary data were collected from the Maternal and Child Health center medical records. The information collected includes characteristics of pregnant women (age, ethnicity, education, occupation, gestational ageduring HBsAg examination, method of delivery and newborn weight), Hepatitis B status and ANC examination (ANC compliance, blood pressure, mid-upper arm circumferencesize, hemoglobin laboratory test). All data is compiled and prepared in a format for analysis purposes.

2.4 Research Ethics

This study has obtained ethical approval from the Health Research Ethics Commission (KEPK) of the Faculty of Medicine, University of North Sumatera number:1317/KEPK/USU/2024. The study was conducted while maintaining the confidentiality of patient personal information and following the principles of health research ethics.

2.5 Data Analysis

Univariate analysis is used to describe the distribution and characteristics of the variables studied. Bivariate analysis is carried out to assess the relationship between pregnant women Hepatitis and ANC check-up (ANC compliance, blood pressure, mid-upper arm circumference measurements and hemoglobin laboratory tests) against the incidence of LBW, using the Chi-square test or Fisher's Exact Test.

3.Research result

3.1 Characteristics research subject

Table 1 showsthe majority of pregnant women were in the ideal reproductive age (17–35 years, 82,5%), dominated by Javanese (35%) and Batak (23,3%). Most had secondary education (68,3%) and were unemployed (73,3%), which could affect access to health services. HBsAg examinations were mostly performed in the second trimester (49,2%), but only 20% reached the 6th ANC visit. Blood pressure was generally normal (97,5%), but half had anemia (52,5%) and 20% had below normal mid-upper arm circumference, indicating a risk of malnutrition. HBsAg status was evenly distributed (50% positive/negative), with caesarean section delivery dominating (54,2%) and low LBW incidence (5%).

Table 1. Frequency Distribution of Research Subject Characteristics

Characteristics	n (120)	Percentage
Age		
≤ 16 years	1	0,8
17-35 years	99	82,5
> 35 years	20	16,7
Ethnic group		
Java	42	35
Batak	28	23,3
Mandailing	5	4,2
Minangkabau	4	3,3
Malay	24	20
Karo	5	4,2
Aceh	2	1,7
Etc.	10	8,3
Education		
Elementary (≤ Junior High)	20	16,7
Middle School (SMA)	82	68,3
High (Academy/College)	18	15
Work		
Doesn't work	88	73,3
Work	32	26,7
Gestational age at time of HBsAg examination		
Trimester 1 (0-12 weeks)	37	30,8
Trimester 2 (13-28 weeks)	59	49,2
Trimester 3 (29-40 weeks)	24	20
ANC Compliance		
First visit (K1)	39	32,5
4th Visit (K4)	57	47,5
6th Visit (K6)	24	20
Blood pressure		
≥140/90mmHg	3	2,5
<140/90mmHg	117	97,5
Mid-upper arm circumferencesize		
< 23.5 cm	24	20

Characteristics	n (120)	Percentage
≥ 23.5 cm	96	80
Hemoglobin laboratory test		
< 11 g/dl	63	52,5
≥ 11 g/dl	57	47,5
Hepatitis B		
Positive	60	50
Negative	60	50
Delivery method		
Normal	55	45,8
Caesarean section	65	54,2
Newborn baby weight		
< 2500 grams	6	5
≥ 2500 grams	114	95

Table 2. Frequency Distribution of Characteristics of Pregnant Women with Positive HBsAg

Characteristics	Pregnant mother n=120	
	HBsAg Positive n=60	HBsAg Negative n=60
Age		
≤ 16 years	0 (0%)	1 (100%)
17-35 years	50 (50,5%)	49 (49,5%)
› 35 years	10 (50%)	10 (50%)
Ethnic group		
Java	17 (40,5%)	25 (59,5%)
Batak	18(64,3%)	10(35,7%)
Mandailing	1 (20%)	4 (80%)
Minangkabau	3(75%)	1 (25%)
Malay	10 (41,7%)	14 (58,3%)
Karo	1 (20%)	4 (80%)
Aceh	2 (100%)	0 (0%)
Etc. (Nias)	8 (80%)	2 (20%)
Education		
Elementary (≤ Junior High)	13(65%)	7 (35%)
Middle School (SMA)	33 (40,2%)	49 (59,8%)
High (Academy/College)	14 (77,8%)	4 (22,2%)
Work		
Doesn't work	40 (45,5%)	48 (54,5%)
Work	20 (62,5%)	12 (37,5%)
Gestational age at time of HBsAg examination		
Trimester 1 (0-12 weeks)	12(32,4%)	25 (67,6%)
Trimester 2 (13-28 weeks)	38 (64,4%)	21 (35,6%)
Trimester 3 (29-40 weeks)	10 (41,7%)	14(58,3%)
Delivery method		
Normal	8 (14,5%)	47 (85,5%)
Caesarean section	52 (80%)	13 (20%)

Table 2 shows pregnant women with positive HBsAg were mostly found at the age of 17–35 years (50,5%). The highest proportion was found in the Batak (64.3%) and Nias (80%) tribes, while the Javanese (59,5%) and Malay (54%) tribes were more dominant in the negative group. Positive HBsAg was more common in highly educated mothers (77,8%) and those who worked (62,5%). The most examinations were carried out in the second trimester (64,4%). Delivery by cesarean section was more common in mothers with positive HBsAg (80%) compared to those who were negative.

3.2 Relationshipsbetween Pregnant Women with Hepatitis B and the Incidence of LBW

Table 3. Relationship between Pregnant Women with Hepatitis B and the Incidence of LBW

Variables	Pregnant mother n=120		p-value
	Hepatitis B Yes (n=60)	Hepatitis B No (n=60)	
LBW Incident			
Yes	3 (5%)	3 (5%)	1,000
No	57 (95%)	57 (95%)	

Table 3show as many as 5% of pregnant women with positive or negative Hepatitis B give birth to LBW babies, while 95% do not. Statistical tests show a p value = 1,000 (p>0,05), indicating that there is no significant relationship between Hepatitis B status in pregnant women and the incidence of LBW.

3.3 Relationships ANC Examination with LBW Incident

Table 4. Relationship between ANC Examination and LBW Incidence

Variables	Pregnant mother n=120		p-value
	LBW n=6	No LBW n=114	
ANC Compliance			
First visit (K1)	6 (15,4%)	33 (84,6%)	0,001
4th Visit (K4)	0 (0%)	57 (100%)	
6th Visit (K6)	0 (0%)	24 (100%)	
Blood pressure			
≥ 140/90 mmHg	0 (0%)	3 (100%)	1,000
< 140/90 mmHg	6 (5,1%)	111 (94,9%)	
Mid-upper arm circumference size			
< 23.5 cm	3 (12,5%)	21 (87,5%)	0,094
≥ 23.5 cm	3 (3,1%)	93 (96,9%)	
Hemoglobin laboratory test			
< 11 g/dl	4 (6,3%)	59 (93,7%)	0,682
≥ 11 g/dl	2 (3,5%)	55 (96,5%)	

Table 4 shows that only ANC visit compliance is significantly associated with LBW cases (p=0,001). All LBW cases occurred in mothers who only made the first visit (K1), while none occurred in K4 and K6, indicating that ANC compliance reduces the risk of LBW. The variables of blood pressure, mid-upper arm circumference, and hemoglobin did not show a significant relationship (p:1,000; 0,094; 0,682), although there was a tendency for higher risk in mid-upper arm circumference <23,5 cm (12,5%) and haemoglobin <11 g/dl (6,3%). This confirms the importance of ANC compliance as a major protective factor against LBW.

4. Discussion

4.1 Frequency Distribution Characteristics of Pregnant Women with Hepatitis B and Pregnant Women with Low Birth Weight

The majority of pregnant women in this study were aged 17–35 years, which is the ideal reproductive age [15]. All cases of LBW and the majority of Hepatitis B infections occurred in this age group, in line with the finding that the highest reproductive activity occurs in this age range [16,17]. However, age is not the only risk factor for LBW [18]. Javanese and Batak tribes dominate the population, but cases of LBW are more common in Malay and Nias tribes. This shows that the distribution of Hepatitis B and LBW is not always parallel and can be influenced by cultural factors and eating habits [19,20]. Most mothers have secondary education, but LBW is more common in the primary education group. Mothers with low education tend to have limited access to information and health services,

thus increasing the risk of infection and LBW [21,22]. The group of unemployed mothers had a higher LBW rate, while working mothers were more likely to be detected with Hepatitis B, possibly due to differences in exposure and access to health services [23,24]. Hepatitis B infections are most often detected in the second trimester, but cases of LBW are more common when screening is performed in the third trimester, when the risk of vertical transmission increases sharply [25,26].

4.2 Distribution of the Proportion of LBW in Pregnant Women with Hepatitis B

This study found that the proportion of LBW in pregnant women with Hepatitis B was 5%, the same as the group without Hepatitis B. Although there was no difference between groups, this figure is higher than the national average (3,9%) and research at Kasihan II Bantul Health Center (2%) [23], but lower than the report from Gunung Sindur Health Center (55%) [27] and Panembahan Senopati Bantul Regional Hospital (65,9%) [28].

4.3 Relationship between Pregnant Women Hepatitis Bwith the LBW Incident

Vertical transmission of Hepatitis B, especially during the perinatal period, is the main route of infection in endemic areas. Approximately 95% of infants infected during this period are at risk of becoming chronic carriers [29]. Infection can be acute or develop into chronic, depending on the mother's immune response [30]. Previous studies have shown that pregnant women with acute infections, especially those who are HBeAg positive or with cirrhosis, have a higher risk of giving birth to babies with LBW [31,32,33]. However, the results of this study showed no significant relationship between Hepatitis B and the incidence of LBW (p value = 1,000). Several large studies also found no significant difference in the incidence of LBW between mothers with and without Hepatitis B infection [13,17,34,35,36]. Biologically, virus transmission requires breakdown of the placental barrier or direct exposure of trophoblast cells to maternal blood [25]. Although the risk of transmission increases if infection occurs in the last trimester (up to 90%), not all cases have a direct impact on birth weight [5].Antiviral therapy such as Tenofovir has been shown to be safe and effective in reducing the risk of vertical transmission without increasing the incidence of LBW [37]. In addition, pregnancy monitoring through ANC, including referral to advanced facilities and timely treatment, plays an important role in controlling the clinical impact of infection [38,39]. Based on the researcher's observation, some HBsAg positive mothers were referred to Adam Malik Hospital and some continued ANC at the health center. Although Hepatitis B infection in pregnant women can transmit the virus vertically, not all cases cause fetal growth disorders or LBW. The risk of LBW is lower if the mother is in stable condition, without cirrhosis or active hepatitis, with a low viral load, and receives appropriate antiviral treatment and undergoes ANC according to standards. The use of antivirals such as tenofovir is safe during pregnancy and does not increase the risk of LBW. There were several pregnant women in this study who had received Hepatitis B treatment, but did not give birth to LBW. In this study, there were only three cases of LBW, which were too small for significant statistical analysis. The exact time of infection is also unknown, which is a limitation in assessing its impact on fetal growth. Therefore, further research is needed with a larger sample size and a more controlled clinical and virological approach to evaluate the effect of maternal Hepatitis B on LBW.

4.4 ANC Compliance Relationshipwith LBW

ANC is a pregnancy examination that aims to monitor the mother's health until delivery and postpartum, carried out at least six times according to standards [40]. The analysis of this study shows a significant relationship between ANC compliance and the incidence of LBW (p=0,001), where all mothers who gave birth to LBW only made a K1 visit without continuing to K4. This reflects a gap in the continuity of ANC services [41], which has the potential to cause under-monitored pregnancy conditions and increase the risk of LBW. This finding is in line with other studies that show that ANC visits of less than four times are significantly associated with LBW [42,43,44,45]. Factors for non-compliance in continuing ANC include secondary education that does not support understanding

of the importance of complete ANC, productive age with busy work or household, delay in initial examination (K1 in the second trimester), minimal social and family support, and the perception that ANC is only needed when there are complaints [46,47,48,49,50]. In addition, the role of Puskesmas and Posyandu in urban areas such as Medan is considered less than optimal because people prefer curative services rather than promotive and preventive services. Researchers assume that the low frequency and continuity of ANC visits are important factors in increasing the risk of LBW due to lack of monitoring, education, and intervention during pregnancy.

5. Conclusion

This study shows that there is no significant relationship between pregnant women with Hepatitis B, blood pressure, mid-upper arm circumference size and level hemoglobin with the incidence of LBW, but compliance with ANC visits has a significant effect on infant birth weight. LBW is a multifactorial condition that is influenced by health service access behavior. It is recommended that the Health Center strengthen ANC education and monitoring, and utilize technology for ANC visit reminders. Health workers need to strengthen their counseling and referral skills for Hepatitis B cases. Further research is recommended to focus on the quality of ANC services and strategies forreducing LBW.

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