



Factors Associated with Hepatitis B Infection in Pregnant Women in Denpasar City in 2024: A Case-Control Study

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ABSTRACT

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Hepatitis B infection during pregnancy remains a significant public health issue due to its maternal and neonatal complications. This study aimed to identify factors associated with Hepatitis B infection among pregnant women in Denpasar City. A case-control design was conducted from February to April 2024 in four randomly selected community health centers, involving 128 pregnant women (64 HBsAg-positive and 64 HBsAg-negative) chosen through multistage random sampling. Data were collected using questionnaires and health center records, and analyzed with bivariate tests and logistic regression. Bivariate analysis showed significant associations between education level, parity, water source, and abortion history with Hepatitis B infection. Multivariate analysis revealed that women with primary/secondary education had a 3.4-fold higher risk of infection (AOR = 3.398; 95% CI: 1.272–9.075), and those using well water had nearly a threefold higher risk (AOR = 2.979; 95% CI: 1.343–76.607). History of blood transfusion increased the risk threefold (AOR = 3.022; 95% CI: 1.180–7.724), while abortion history was the strongest predictor (AOR = 26.267; 95% CI: 2.868–240.601). In conclusion, low education, unsafe water sources, blood transfusion, and abortion were key risk factors. Strengthening maternal education and infection control in reproductive health services is essential.

INTRODUCTION

Hepatitis B infection is a sexually transmitted infection that remains a global health problem, including in Indonesia. Transmission of hepatitis B from mother to child occurs vertically. This transmission occurs during pregnancy, childbirth, and breastfeeding. The rate of transmission of hepatitis B from mother to child is 90-95⁽¹⁾. Cases of Hepatitis B in pregnant women are also related to the characteristics of the mother⁽²⁾. Characteristics include the personality, attitudes and values held by the mother, which can include age, education, occupation, number of children and location of residence, which can influence a person's behavior⁽³⁾.

Hepatitis B infection is a major health problem in Indonesia, particularly for women, and its impact on children infected by their mothers. In 2014, the highest number of women infected with the hepatitis B virus was in the 25-49 age group, primarily housewives⁽¹⁾. According to data from the World Health Organization (WHO) in Southeast Asia in 2015, Hepatitis B infections in Southeast Asia accounted for 15% of the total number of Hepatitis B patients worldwide, with a total of 39 million



people. Data from Indonesia in 2021 showed the prevalence of Hepatitis B reached 2.5%⁽¹⁾. In 2021 in Bali, there were 1.2% cases of Hepatitis B among housewives and this was automatically followed by an increase in the number of pregnant women infected with Hepatitis B⁽²⁾. The average age group for pregnant women with Hepatitis B is 20 to 35 years old because the age of 20 to 35 is the age of a woman who is sexually active and pregnant women who are Hepatitis B positive⁽⁴⁾.

Based on data from the Bali Provincial Health Office in 2022, the average number of pregnant women in Bali reached 67,000 people per year, and of that number, 1.46% or 978 pregnant women were exposed to Hepatitis B⁽⁵⁾. Denpasar City ranked first with a total of 196 cases or 1.9% of Hepatitis B cases in pregnant women in 2022⁽⁶⁾. The high number of cases of pregnant women with Hepatitis B also increases the risk of new Hepatitis B sufferers, because Hepatitis B transmission can occur through perinatal or Mother to Child Transmission (MTCT) which occurs during pregnancy with a risk level of 5 to 10%, during childbirth 10 to 20% and 5-20% during breastfeeding. The Hepatitis B virus is easily transmitted from mother to child, usually often occurs during childbirth through exposure to blood and body fluids. Babies infected with Hepatitis B at birth have the potential to become chronic with the risk of various complications.

Although the prevalence of Hepatitis B in Indonesia has decreased in recent years, the threat of vertical transmission (mother-to-child) remains a significant public health challenge. The 2023 Basic Health Research (Riskesdas) data shows that the national prevalence of Hepatitis B has decreased from 7.1% in 2013 to approximately 2.4% in 2023⁽⁷⁾. According to a report from the Ministry of Health, by 2024, approximately 89.6% of pregnant women in Indonesia had undergone Hepatitis B screening, and more than 93% of infants born to mothers with reactive HBsAg had received HB0 immunization and, if available, HBIG within 24 hours of birth⁽⁸⁾.

Research in various regions of Indonesia also indicates risk factors associated with Hepatitis B infection in pregnant women. A case-control study in Bombana Regency found that maternal lack of knowledge, history of contact with Hepatitis B sufferers, the role of health workers, and environmental conditions were significantly associated with Hepatitis B incidence in pregnant women⁽⁹⁾. Another study in Banjarmasin City reported that partner status (whether positive or not), history of blood transfusions, and a history of Hepatitis B in the family were risk factors in themselves⁽⁹⁾.

On the other hand, several variables that are often considered as risk factors such as parity, education level, occupation, age at first marriage, frequency of couple's marriages, tattoo history, or couple's mobility in several studies do not always show a significant relationship. Although there is 2022 data showing the prevalence of infected pregnant women in Denpasar (1.9%) as part of the cases of pregnant women who tested positive for Hepatitis B in Bali, more recent and in-depth research using case-control methods is needed to explore specific factors in Denpasar City. The purpose of this study is to determine factors associated with hepatitis B infection in pregnant women in Denpasar City in 2024.

METHOD

This study design is a case-control study, conducted from February to April 2024. The population in this study were all pregnant women in the working area of the Denpasar City Community Health Center from February to April 2024. The sampling technique used was multistage random sampling. From 11 Community Health Centers in Denpasar City, 4 Community Health Centers were randomly selected. Furthermore, the case and control study subjects were taken using simple random sampling, each with 64 people. The sample size was determined using the Lemeshow formula, referring to the study. The inclusion criteria were mothers who are registered as pregnant in the period from February to April 2024. Complete registration data and have a telephone number. The analysis techniques used were bivariate tests and binary logistic regression. In this study, the data collected were primary and secondary data. Primary data was research data obtained directly from respondents, namely





through questionnaires. Secondary data was obtained from the register of pregnant women at the community health center. This study has received ethical approval with the number: DP.04/02/F.XXXII.25/0143/2024

RESULT AND DISCUSSION

This survey included a representative sample of 128 pregnant women who met the inclusion criteria. These consisted of 64 cases (pregnant women who were hepatitis B positive) and 64 controls (pregnant women who were not hepatitis B positive).

Characteristics of the Sample

The results of the study on the characteristics of pregnant women based on age, last education, location of residence, occupation, parity, water source, history of blood transfusion, history of abortion, history of surgery, location of residence and sexual activity with hepatitis B infection in pregnant women at the Denpasar City Health Center in 2024 can be seen in table 1.

Table 1.
 Frequency distribution of respondent characteristics

Variabel	Frequency (f)	Proportion (%)
Age		
< 20 years / > 35 years	25	19.5
20 – 35 years	103	80.5
Education		
Primary/Secondary Education	93	72.7
Higher Education (Diploma/Bachelor)	35	27.3
Employment		
Employed	69	53.9
Unemployed	59	46.1
Gravida		
Primigravida	77	60.2
Multigravida	51	39.8
Water Source		
Well	69	53.9
Municipal Water Supply	59	46.1
Blood Transfusion		
Ever	30	23.4
Never	98	76.6
Abortion		
Ever	14	10.9
Never	114	89.1
Surgery		
Ever	38	29.7
Never	90	70.3
Family Type		
Nuclear Family	87	68.0
Extended Family	41	32.0
Sexual Activity Condom Use		
Condom	17	13.3
Not Using Condom	111	86.7



In the age variable, it is dominated by respondents aged 20-35 years, in the last education variable, it is dominated by respondents who have secondary education (high school). The respondents' residence is dominated by the South Denpasar area, the research subjects are dominated by respondents who work, in the parity category, it is dominated by the primipara category, the water source used by respondents is dominated by those who use wells, in the transfusion history category, it is dominated by respondents who have never had a blood transfusion, in the abortion history category, it is dominated by respondents who have never had an abortion, in the surgery history category, it is dominated by respondents who have never had surgery before, in the family type history category, it is dominated by respondents who live at home only with the nuclear family, and the sexual activity of the research subjects is dominated by those who do not use condoms.

Risk factors for Hepatitis B Infection

Table 2
Bivariate analysis of factors associated with hepatitis B infection.

Variabel	Case		Control		Crude OR	95% CI	<i>p value</i>
	f	%	f	%			
Age							
< 20 years / > 35 years	16	25.0	9	14.1	0.491	0.199 – 1.212	0.119
20 – 35 years	48	75.0	55	85.9			
Education							
Primary/Secondary Education	52	81.3	41	64.1	0.411	0.183-0.924	0.029
Higher Education (Diploma/Bachelor)	12	18.8	23	35.9			
Occupation							
Employed	35	54.7	34	53.1	0.939	0.469 – 1.882	0.7859
Unemployed	29	45.3	30	46.9			
Gravida							
Primigravida	32	50.0	45	70.3	2.368	1.145-4.897	0.019
Multigravida	32	50.0	19	29.7			
Water Source							
Well	44	68.8	25	39.1	0.291	0.141-0.604	0.001
Municipal Water Supply	20	31.3	39	60.9			
Blood Transfusion							
Ever	18	28.8	12	18.8	0.590	0.257-1.354	0.211
Never	46	71.9	52	81.3			
Abortion							
Ever	13	20.3	1	1.6	0.062	0.008-0.492	0.001
Never	51	79.7	63	98.4			
Surgery							
Ever	19	29.7	19	29.7	1.000	0.468 – 2.135	1.000
Never	45	70.3	45	70.3			
Family Type							
Nuclear Family	46	71.9	41	64.1	0.698	0.331	1.472
Extended Family	18	28.1	23	35.9			
Condom Use							
Using	11	17.2	6	9.4	0.498	0.172-1.442	0.193
Not Using	53	82.8	58	90.6			
Total	64	100	64	100			





Based on Table 2, there is a significant relationship between education level, parity, drinking water source, and history of abortion with Hepatitis B infection. Meanwhile, between age, occupation, location of residence, transfusion history, surgical history, family type, and condom use, there is no significant relationship with Hepatitis B infection.

This study revealed several factors significantly associated with Hepatitis B infection among pregnant women in Denpasar. Multivariate analysis identified low education level, use of well water, history of blood transfusion, and history of abortion as the strongest predictors of infection. Other variables such as age, occupation, family type, condom use, and surgical history were not statistically significant.

Pregnant women with primary or secondary education had a 3.4-fold higher risk of Hepatitis B infection compared to those with higher education. This finding may be explained by the fact that women with lower education often have limited health knowledge, less access to health services, and lower adherence to preventive measures such as HBV screening and vaccination. In contrast, higher education enhances awareness and enables mothers to adopt healthier practices. Similar results were reported in China, where lower maternal education was associated with higher risk of HBV-related adverse pregnancy outcomes, underscoring the role of education as a social determinant of health^(10, 12).

The use of well water as the primary source of drinking water was also found to increase the risk of infection by nearly three times. Although Hepatitis B is not primarily a waterborne disease, unsafe water sources may reflect poor sanitation and hygiene practices, which in turn contribute to overall vulnerability to infections. In many communities, contaminated wells can serve as indirect indicators of inadequate health infrastructure. Supporting this, a study among Syrian refugees demonstrated that poor sanitation and unsafe water were associated with higher HBV prevalence among pregnant women^(13,14).

There was no association between a history of blood transfusion and hepatitis B infection in pregnant women with an odds ratio of 1.830, meaning that mothers with a history of blood transfusion were not at higher risk of hepatitis B infection than mothers without a history of blood transfusion⁽¹³⁾.

A history of abortion indicates an increased risk of Hepatitis B infection, with an odds ratio of 16.059. Mothers with a history of abortion are at higher risk of Hepatitis B infection than those without a history of abortion because the abortion process can potentially affect the mother's immune system. Abortion can have various physical, psychological, and social impacts. Abortion can be associated with tissue injury. Medical procedures such as tissue injury during curettage can transmit the Hepatitis B virus. Furthermore, curettage following an abortion infection can be a pathway for Hepatitis B infection^(15,16).

Table 3
Multivariate analysis of factors associated with hepatitis B infection

Variables	AOR	95 % CI	p-value
Education			
Primary/Secondary Education	3.398	1.272-9.075	0.015
Water Source			
Well	2.979	1.343-76.607	0.007
Blood Transfusion			
Ever	3.022	1.18-7.724	0.021
Abortion			
Ever	26.267	2.868-240.601	0.004

AOR: Adjusted Odd Ratio, CI: confidence interval



The multivariate logistic regression showed that several factors remained significantly associated with Hepatitis B infection among pregnant women after controlling for other variables. Mothers with a primary/secondary education level were 3.4 times more likely to be infected with Hepatitis B compared to those with higher education (AOR = 3.398; 95% CI: 1.272–9.075; $p = 0.015$). Pregnant women who used well water as their main drinking water source had approximately a threefold higher risk of Hepatitis B infection compared to those using municipal water supply (AOR = 2.979; 95% CI: 1.343–76.607; $p = 0.007$). A history of blood transfusion was also found to be a significant predictor, with mothers who had ever received a transfusion being three times more likely to have Hepatitis B infection (AOR = 3.022; 95% CI: 1.180–7.724; $p = 0.021$). The strongest association was observed with a history of abortion, where mothers with such a history were about 26 times more likely to be infected compared to those without abortion history (AOR = 26.267; 95% CI: 2.868–240.601; $p = 0.004$).

On the other hand, variables such as age, occupation, family type, condom use, and history of surgery did not show significant associations. One possible explanation is that most surgical procedures are now performed under strict sterilization protocols, reducing the risk of transmission. Similarly, age distribution in the sample was relatively homogeneous, which may have limited the ability to detect associations. Interestingly, this contrasts with studies in Iraq, which found parity and maternal age to be significant predictors of HBV, suggesting that risk profiles may differ depending on population characteristics and healthcare systems⁽¹³⁾.

CONCLUSION

This study identified low education level, use of well water, history of blood transfusion, and history of abortion as significant predictors of Hepatitis B infection among pregnant women in Denpasar, while age, occupation, family type, condom use, and surgical history showed no association. These findings highlight the importance of maternal education, safe water access, and infection control in reproductive health services.

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