

RESEARCH ARTICLE

Risk Factors of Intra-familial Hepatitis B Virus Transmission among Hepatitis B Patients in Kupang, Indonesia

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Abstract

Hepatitis B is caused by acute or chronic hepatitis B virus infection. It is the most dangerous liver disease compared to other liver diseases due to its lack of apparent symptoms. The symptoms include slight jaundice in the eyes and skin accompanied by lethargy. This study aimed to determine the risk factors for intra-familial transmission of hepatitis B virus for household contacts of hepatitis B patients. The analytical correlation study with a cross-sectional design was conducted from June to July 2018 in Alak subdistrict, Kupang, Indonesia. Venous blood was collected from 45 subjects consisting of 12 patients and 33 family member. Examination was then performed using HBsAg test strip, resulting in the percentage of transmission of 15.15%. Statistical analysis revealed $p > 0.05$. In conclusions, no relationship between gender, age, education, marital status, occupation, and HBsAg status. These characteristics are not risk factors for conversion of HBsAg status.

Key words: Hepatitis B, household contact, risk factors

Faktor Risiko Penularan Virus Hepatitis B Kontak Serumah di antara Pasien Hepatitis B di Kupang, Indonesia

Abstrak

Hepatitis B disebabkan oleh infeksi virus hepatitis B yang bersifat akut atau kronik. Penyakit ini termasuk penyakit hati yang paling berbahaya dibanding dengan penyakit hati yang lain karena tidak menunjukkan gejala yang jelas. Gejalanya hanya sedikit warna kuning pada mata dan kulit disertai lesu. Penelitian ini bertujuan mengetahui faktor risiko penularan virus hepatitis B pada kontak serumah pasien hepatitis B. Penelitian korelasi analitik dengan desain *cross-sectional* ini dilaksanakan pada bulan Juni sampai Juli 2018 di Kecamatan Alak, Kupang, Indonesia. Darah vena diambil dari 45 subjek yang terdiri atas 12 pasien dan 33 anggota keluarga. Pemeriksaan kemudian dilakukan menggunakan strip tes HBsAg menghasilkan persentase penularan 15,15%. Analisis statistik didapatkan $p > 0,05$. Simpulan, tidak terdapat hubungan antara jenis kelamin, usia, pendidikan, status pernikahan, pekerjaan, dan status HbsAg. Karakteristik ini bukan faktor risiko untuk konversi status HBsAg.

Kata kunci: Faktor risiko, hepatitis B, kontak serumah

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Introduction

Acute jaundice may be caused by hepatitis A, B, C, and E virus. Hepatitis A and E are often the main causes of the jaundice outbreak. Unlike hepatitis B and hepatitis C, hepatitis A does not develop into a severe and chronic disease.^{1,2} Infection due to chronic hepatitis B virus is still a global health problem with an estimation that 350 million people in the world are infected with this virus. Indonesia is a country with a high prevalence of hepatitis B.^{3,4} Efforts to have national-level data on this disease were made in 2007 with the implementation of a national surveillance, referred to Indonesian Basic Health Research (IBHR), by collecting samples from 21 of 33 provinces in Indonesia. The prevalence of HBsAg, anti-hepatitis core antibody (anti-HBc), and anti-HBs was 9.4% (of 10,391 samples), 32.8% (of 18,867 samples), and 30.6% (of 16,904 samples) respectively.^{1,5} The recent IBHR, which was conducted in 2013 in 33 provinces, showed HBsAg, anti-HBc, and anti-HBs prevalence of 7.1% (of 40,791 samples), 31.9% (of 38,312 samples), and 35.6% (of 39,750 samples) respectively.⁶ It is worthy to note that there has been a decline in the prevalence of HBsAg (9.4% in 2007 to 7.1% in 2013), indicating that Indonesia has moved from high to moderate HBV endemics.⁵

Hepatitis is an inflammation or infection of the liver cells. The most common cause of hepatitis is a virus that can cause swelling and softening of the liver. Patients often do not realize that they have been infected with the hepatitis B virus and are also unconsciously transmitting to others. Globally, the Western Pacific region has the highest hepatitis B prevalence of 6.2%, followed by the African region (6.1%), Eastern Mediterranean region (3.3%), Southeast Asia region (2.0%), European region (1.6%), and American region (0.7%).⁷

In Indonesia, the number of hepatitis B sufferers in a healthy population is estimated at 4% to 20.3%.⁸ According to the International Task Force on Hepatitis B Immunization, Indonesia belongs to the moderate and high endemic hepatitis B group, with a prevalence of 7–10%. At least 3.9% Indonesian pregnant women have hepatitis with a 45% risk of maternal transmission. At present, it is estimated that there are more than 11 million hepatitis B sufferers in Indonesia. In countries with a low prevalence of

hepatitis B, most sufferers are aged 20–40 years whereas in countries with a high prevalence of hepatitis B, most of them are children.^{9,10}

In 2010, the population of East Nusa Tenggara was 7,015,967 people with the prevalence of hepatitis B being 0.3–1.8. Most hepatitis cases were found in East Sumba and West Sumba districts.⁶ Kambuno et al.¹¹ reported that the prevalence of hepatitis B and hepatitis C was 3.5% and 0.5%, respectively. Data from blood donor screening test in 2017 concluded that there was no relation between characteristics (age, sex, occupation) of blood donors and the prevalence of hepatitis B and C.

Hepatitis B virus can horizontally be transmitted by infected patients through their body fluids such as semen, saliva, blood or blood products, female genital mucous, menstrual blood, and other body fluids. Those at risk are newborns and people who are involved in unsafe sexual intercourse; use contaminated knife and syringe; receive piercing and tattoos; use contaminated toothbrush; and drinking from contaminated glass.^{12,13}

New cases of hepatitis B virus (HBV) infection continues to occur in various areas of the world. Transmission from mother to child during pregnancy, which is referred to as vertical transmission or mother transmission to children (MTCT) is one of the biggest causes of chronic hepatitis B infection with maternal viremia as the most important contributing factor.^{14–16} In endemic areas, MTCT reaches 25–30% with the lifetime risk of infection up to 60%.^{13,17}

Several studies have shown that the presence of infected family members significantly increases the risk of familial transmission.^{13,18–20} According to Aini and Susiloningsih¹² family history of hepatitis B with OR 7.633 is statistically significant ($p < 0.05$). A person with a family history of hepatitis B has a seven times greater risk that those who do not have a family history of hepatitis B.¹²

This study aimed to determine the risk factors for intra-familial transmission of hepatitis B virus for household contacts of hepatitis B patients.

Methods

This was a cross-sectional analytical correlation study performed from June to July 2018 in the work area of Manutapen Public Health Center

(pusat kesehatan masyarakat/puskesmas), Alak subdistrict, Kupang city, East Nusa Tenggara, Indonesia. Puskesmas Manutapen has outpatient clinics and supervises two sub-puskesmas. Data in this puskesmas showed that 17 patients were found to be HBsAg positive in 2017. The population of this study was all 68 family member from the 17 hepatitis B positive patients, but family members who meet the inclusion criteria were 33 people. From each subject, 3 mL of the venous blood sample was collected and then stored at 4°C for testing.

Reactive HBsAg results were analyzed using correlation coefficient to determine the relationship. Other data were analyzed using chi-square (X-tests²) and odds ratio (OR).

This study was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Nusa Cendana, Kupang with the letter number: 13/UN15.16/KEPK/2018.

Results

This study was conducted on family members of hepatitis B patients using HBsAg test strip to assess the presence or absence of transmission in household contacts. Results showed that 12 patients still presented reactive results, and 5 of 33 (15.15%) family members were found to be

HBsAg positive.

Despite the fact that there were more females who were HBsAg reactive (n=11) compared to male (n=6), the difference was insignificant (p=0.731), showing the lack of relationship between gender and HBsAg status. Most of positive subjects were >16 years old with only 1 were <16 years old (p=0.282). No relationship was found between age and HBsAg status. HBsAg status was also found to have no relationship with marital status (p=0.195), occupation (p=0.295), and education (p=0.912) (Table 1).

The frequency of HBsAg positive among Family Members is listed in Table 2. More HBsAg positive cases was found among children of hepatitis B patients. The prevalence of HBsAg-positive cases in husband, wife, and other members was identical.

Discussion

Hepatitis B transmission can occur vertically from hepatitis B positive mother to the child during pregnancy.²⁰ According to research from Rosalina,¹⁹ infants who fail to form protective immunity can be infected with the hepatitis B virus which may lead to chronic hepatitis and, eventually, hepatocellular carcinoma. They are also likely become a carrier of hepatitis B and

Table 1 Household Contacts of Hepatitis B Patient

| Variables | Patients (n=12) | Family Members (n=33) | | p Value |
|--------------------|------------------|-----------------------|----------------|---------|
| | | HBsAg Positive | HBsAg Negative | |
| Gender | | | | |
| Male | 1 | 5 | 14 | 0.731 |
| Female | 11 | – | 14 | |
| Age (years) | | | | |
| >16 | 12 | 3 | 23 | 0.282 |
| <16 | – | 2 | 5 | |
| Marital status | | | | |
| Married | 11 | 3 | 18 | 0.195 |
| Single | 1 | 2 | 10 | |
| Occupation | | | | |
| Working | 1 | 4 | 13 | 0.295 |
| Not working | 11 | 1 | 15 | |
| Level of education | | | | |
| High | 5 | 2 | 12 | 0.912 |
| Low | 7 | 3 | 14 | |

Table 2 Frequency of HBSAg Positive among Family Members

| Family Members | HBsAg Positive |
|----------------|----------------|
| Husband | 1/33 |
| Wife | 1/33 |
| Son/Daughter | 2/33 |
| Others members | 1/33 |

transmit the disease to others.

In endemic areas including Southeast Asia, hepatitis B transmission from mother to child reaches 25–30% with the lifetime risk of infection up to 60%. Thus, efforts are needed to prevent transmission by taking into account the possibility of immunoprophylaxis failure. Immunoprophylaxis is considered as the most important part of hepatitis B vertical transmission prevention which also prevent other consequences of hepatitis B.^{16,21} Perinatal transmission reaches 70–90% in positive HBeAg and HBeAg mothers without immunoprophylaxis. Hence, the comprehensive strategy to eliminate hepatitis B infection includes immunoprophylaxis, which is proven to be able to prevent up to 95% of vertical transmission in infants with hepatitis B mother.^{20,22}

A study by Mohammad Alizadeh et al.¹⁷ in Nahavand, Iran concluded that the prevalence of positive HBsAg in Nahavand is 2.3%. Brothers (1–25%) and fathers (1–12.5%) have higher HBsAg marker. The infection rate in husbands and wives of index cases was 10%. Sons and daughters were the most frequent relatives of index cases (32.2% and 23.5%, respectively). In this Iran study, twelve (11%) family members were HBsAg positive, fifty (56.2%) were HBsAb positive, and only one (2.5%) was HBcAb positive.

No relationship was found between sex, age, education, marital status, occupation, and HBsAg status, as evident from the chi-square test results. Shephard et al.²¹ also reported that transmission within families is less reported. Intra-familial transmission of HBV is evident in several studies and was possibly associated with the presence of one HBV carrier in the family and the shared use of toothbrushes among household contacts.^{23–25}

Hepatitis B is transmitted through percutaneous (i.e., puncture through the skin)

or mucosal (i.e., direct contact with mucous membranes) exposure to infected blood or body fluids.^{26,27} HBV can cause chronic infection, resulting in liver cirrhosis, liver cancer, liver failure, and death. People with chronic infection also becomes the main reservoir for advanced HBV transmission.²³ Although chronic infection is more likely to develop in infected people during infancy or childhood, the highest rate of new infections and acute illnesses is highest among adults.^{15,19}

Based on the research, found the pattern of transmission of hepatitis B virus, namely mothers with HBsAg are directive to children. This transmission can occur through the birth process when micro transfusion occurs or there is contact between the mother's blood and the baby's mucosa during contraction. Meanwhile, transplacental transmission is rare and is estimated to only range from 5% to 15% of all pregnancies with hepatitis B. Hepatitis B e antigen (HBeAg) is the only structure of the hepatitis B virus that can penetrate the placental blood barrier because it has a small molecular weight. Because of the cross-reaction with envelope antigens and core antigens in the recognition of antigens, the transfer of HBeAg through the placenta will cause fetal immunotolerance against Antigens Hepatitis B core (HbcAg). This triggers chronic hepatitis B infection after birth.¹⁵

It is possible that a HBsAg reactive husband has a non-HbsAg reactive wife but with HBsAg reactive child. This may be due to percutaneous or mucosal exposure to infected blood or body fluids, for example through sharing a toothbrush or razor blade, contact with exudates from dermatological lesions, or contact with contaminated surfaces HBsAg). People with chronic HBV infection can also transmit HBV elsewhere (such as in schools, childcare centers, or facilities for people with developmental disabilities) especially if they behave aggressively or have medical problems (for example, exudative dermatitis or open skin lesions) that increase risk of exposure to blood or serous secretions.^{15,17}

However, HBsAg reactive wife can also transmit the disease to the husband or vice versa. A study in the United States has proven that the hepatitis B infection in adults can be transmitted through sexual contacts. In adults who do not receive vaccination, the groups that have a higher risk for getting hepatitis B are people with

multiple sexual partners, injecting drug users, men who have sex with men, and those who are the household contacts and sex partners of people with hepatitis B.¹⁵

Our study had several limitations in the form of small sample size and limited period of study that affects the number of blood samples obtained. Also, some patients could be contacted. It is suggested that a follow up study is conducted with a bigger sample size.

Conclusions

The percentage of intra-familial hepatitis B transmission in the work area Puskesmas Manutapen, Alak, Kupang city, Indonesia is 15.15%. No relationship was found between gender age, education, marital status, occupation, and HBsAg status. Hence, gender, age, education, marital status, and occupation are not risk factors for hepatitis B.

Conflict of Interest

Authors declare no conflicts of interest.

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