



Sharing of Personal Sanitary Kits as One Risk Factor of Horizontal Transmission of Hepatitis B among Children Resident at Orphanage

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Abstract

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BACKGROUND: Hepatitis B is a disease that infects the liver and is caused by the infection of a hepatitis B virus (HBV), and is becoming a global health issue, especially in developing countries including Indonesia. Hepatitis B can be transmitted through several ways such as infected bodily fluids. Indeed, children who live together in an orphanage are prone to having a high chance of transmitting Hepatitis B to each other.

AIM: The purpose of this study was to analyze the factors associated with the prevalence of infected Hepatitis B.

METHODS: This research used casecontrol study methodology by taking 15 positive case samples and 33 controlled uninfected patients and was conducted in six orphanages in Kupang Municipality in NTT between July 2019 and November 2019. There were 310 orphanage residents participating in this research.

RESULTS: The research denotes that variables of using a shared toothbrush, nail clipper, and shaver show a significant connection with their Hepatitis B status ($p < 0.05$). A further analysis also indicates that using a shared shaver and toothbrush for 12.6 times has a high risk of being infected by Hepatitis B compared to those who do not share their personal items.

CONCLUSION: Vaccinations and meeting the basic needs of every child in orphanages are essential in order to minimize the risk of Hepatitis B transmission.

Introduction

Hepatitis B is caused by acute or chronic hepatitis B virus (HBV) infection. It is the most dangerous liver disease compared to other liver diseases due to its lack of apparent symptoms [1]. There are approximately 257 people chronically infected by the HBV, and this virus remains the main infection problem in the world [2]. This can be made worse by complications with cirrhosis and hepatocellular carcinoma that contribute to 887.000 deaths every year [3], [4]. Based on Basic Health Research in 2007, the prevalence of hepatitis B surface antigen (HBsAg) in Indonesia was 9.4% [5], but this figure declined to 7.1% in 2013 with 250 million people of total population [6]. This shows that Indonesia has shifted from a highly endemic Hepatitis B country to a moderately endemic country [3], [6].

Several previous studies have reported the prevalence of Hepatitis B in several countries, including on the island of Crete, HBsAg was found to be positive in 29 people, (3.3%). Antibodies to HBV core antigen

were detected in 287 subjects (32.8%) [7]. Baymakova and Karcheva reported that the morbidity rate of acute HBV infection in Bulgaria was 5.29 cases/100,000 population (95% CI: 3.86–6.73) [8]. The Republic of Macedonia has an estimated HBsAg prevalence of 1–4% [9] and given that chronic HBV infection is a major pathogen for chronic hepatitis, cirrhosis of the liver, and hepatocellular carcinoma, this poses a serious burden for many countries [10].

According to the Basic Health Research data 2013 [6], NTT is rated one of the provinces that has the highest endemic of Hepatitis B infection, and most of the cases are found in East Sumba and West Sumba. Kambuno *et al.* state that, according to blood donor data from the Red Cross Indonesia in NTT, the prevalence of Hepatitis B and Hepatitis C in 2017 was 3,5% and 0,5% respectively [11]. While Kambuno *et al.*, 2016, reveals that out of 89 people investigated based on their history of living in the same house, 18 respondents were positively infected by the virus (20.2%). In 2019, it was then conveyed that the transmission of Hepatitis B through shared house contact was 15.15% (5/33) in

Alak sub-district in NTT [1]. During an examination of 63 hemodialysis patients at RSUD Prof. Dr. Johannes Kupang, it was discovered that seven patients had been positively transmitted with HBsAg (11%) [12].

In addition to being parenterally transmitted (from a mother to the fetus during pregnancy) or mother transmission to children [13], [14]. The HBV can also be horizontally spread to the surrounding environment [15]. People who can be potentially transmitted are usually those who share the same house with the patients [16], prostitutes, drug users, and health workers [17]. Horizontal transmission usually occurs through direct blood contact [18], semen, genital fluid, use of a contaminated syringe, and a shared shaver, nail clipper, and toothbrush [19]. HIV and sexually transmitted diseases represent a significant public health problem worldwide [20].

The fact that the residents of dormitories or orphanages live together as a group and are highly likely to do many daily activities together has increased the risk of Hepatitis B transmission [21], [22]. This can become worse by inadequate housing condition, alternating personal items, and lack of controlling systems from orphanage care. Moreover, the orphans come from a different family background and there is no regular examination into their HBsAg status [23].

Kupang Municipality has at least 25 orphanages with 1100 residents in total. The local government has so far had a concern only about the orphans' food supply but is less focused on their healthcare. The main purpose of this research was to analyze the risk factors of Hepatitis B transmission at orphanages in Kupang. The factors include sex, education background, vaccination status, length of stay at an orphanage, hemodialysis, blood transfusion, receiving injections, dentist visits, history of hospitalization, alternating toothbrushes, nail clippers, and shavers. The results of the study are expected to be a source of information related to the risk factors of hepatitis B transmission and can be used to develop a predictive model of hepatitis B transmission in orphanages.

Methods

This research used observational methodology control study with a casecontrol study design that analytically studied the causal relationships by making use of inverse logic in order to decide the disease (outcome) first and then identifies the causes (risk factors). The definition of HBV infection in this study was the HBsAg reactive status found at the time of examination without any other tests.

The investigation was conducted from July 2019 to November 2019 among the orphanage residents

in Kupang. There were six orphanages involved in this study. The sample measurement employed the formula of calculating the sample population for the casecontrol study design by Lemeshow with a total of 12 cases. In this study, the researchers used 15 positive cases with a comparison of case samples 1: 1 or 1: 2, depending on the number of children in the orphanages and the number of children who were willing to be interviewed. Inclusion criteria; participants are permanent residents of the orphanage for at least 6 months, recommended by the orphanage manager to become research respondents. Exclusion criteria; not willing to be a respondent.

The sampling technique used in this investigation was multistage non-random sampling. In the first stage, quota sampling was taken from six orphanages and accidental/haphazard sampling was carried out to select certain individuals from each orphanage.

The technique of data collection was an in-depth interview by using a structured questionnaire and creating a friendly and communicative atmosphere. The blood samples were taken from venous blood for approximately 3 cc and collected in EDTA tubes which were separated by serum and then followed by an examination of Hepatitis B.

HBsAg tests were performed using Elisa test, Hepanostika HBsAg Ultra (Batch B1V10P01; Biomerieux, Paris, France), simple assay procedure, sensitivity, and specificity are 100%, immunoassay kit according to manufacturer's instructions. Statistical analysis. The baseline data were descriptively summarized. Statistical analyses were performed using Statistical Package for Social Sciences v.20 (SPSS Inc., Chicago, IL), with levels of association assessed by χ^2 test. All statistical significance values were assessed at $p < 0.05$. Utilizing univariable analysis, the data analysis was conducted to describe the characteristics of the respondents and was presented in form of tables and graphs. The next stage was conducting a bivariable analysis. It was undertaken using the Chi-square test which was employed to verify the hypothesis of a significant effect among risk factors. The next analysis was multivariable analysis where it used a multiple logistic regression test to find out the simultaneous effect of independent variables on dependent variables, and the most independent variables that had the greatest effect on dependent variables.

This research has obtained a research ethic approval from the Health Research Commission, Kupang Health Polytechnic of the Ministry of Health of Indonesia number LB.02.03/1/0045/2019 at September 3, 2019. Every child taking part in this study was asked for their consent and to sign an informed form, or they could be represented by their orphanage caregivers.

Results

After the hepatitis status examinations had been conducted, the results indicated that of all 310 respondents participating, 15 respondents were positively infected with HBsAg and 295 were not. The total number of sample data processed in this research was 48 participants with 33 samples were negative and 15 were positive. All the 48 samples are shown in Table 1 about the characteristics of respondents below.

There were 13 variables collected during the interviews and questionnaires, and these were used to investigate the correlation between the variables and their Hepatitis B infection statuses. Answers from the respondents were used to assess the horizontal transmission risks over sharing the same household items that had allowed them to have close contact with the Hepatitis B patients. This habit is evident to have contributed to the contagion of Hepatitis B [1], [24].

Horizontal transmission is one kind of infection transmission of the HBV from a person with Hepatitis B to people in his or her surroundings [24], [25]. One example of horizontal transmission occurs among people who live in the same house, and, specifically for adults, it can happen through several ways such as; contact with blood or blood components; contact with contaminated body fluids from open wounds such

as bites [26], cuts, and bruises; sharing the same toothbrush, shavers, [27] and diabetes treatment tools [28], [29].

In order to examine the correlation between those 13 variables and their Hepatitis B statuses, bivariable analysis was performed.

The results of this bivariable test indicate that from all 13 variables, only three of them show $p < 0.05$. Table 2 shows that the variables that have a significant relationship with infection of hepatitis B are history of using the same toothbrush ($p = 0.000$), history of using the same nail clipper ($p = 0.000$), and history of using the same shaver ($p = 0.000$).

In order to prove how much simultaneous effect these factors had on the virus transmission, a multivariable analysis was conducted. It then resulted in 11 variables not having a simultaneous effect and two variables getting it from a history of using the same shaver and toothbrush.

The results show that the significant value of using the same shaver and toothbrush is <0.05 and the Exps(B) value is 12.66, which means that alternating a shaver and a toothbrush has roughly 12.66 chances to be infected with HBV (Table 3).

Table 1: Respondents' characteristics of orphanage residents

Characteristic	n	%
Sex		
Male	24	50
Female	24	50
Educational qualification		
Elementary School	12	25
Middle School	21	43.8
High School	7	14.6
University	8	16.7
Vaccination status		
No	1	2.1
Yes	47	97.9
Duration of living in orphanages		
<5 years	30	62.5
>5 years	18	37.5
History of hemodialysis		
No/Never	48	100
Yes	0	
History of blood transfusion		
No/Never	44	91.7
Yes	4	8.3
History of receiving injection		
No	8	16.7
Yes	40	83.3
History of dentist visits		
No	38	79.2
Yes	10	20.8
History of Hospitalization		
No	40	83.3
Yes	8	16.7
History of using the same toothbrush		
No	32	66.7
Yes	16	33.3
History of using the same nail clipper		
No	35	72.9
Yes	13	27.1
History of using the same shaver		
No	32	66.7
Yes	16	33.3
History of undergoing a surgery		
No	47	97.9
Yes	1	2.1

Table 2: A bivariable analysis on the risk factors of hepatitis B transmission among orphanage residents in Kupang municipality in 2019

Variables	Status HbsAg		Total	p
	Negative (n=33)	Positive (n=15)		
Sex				
Male	16	8	24	0.755
Female	17	7	24	
Educational qualification				
Elementary School	8	4	12	0.162
Middle School	16	5	21	
High School	6	1	7	
University	3	5	8	
Vaccination status				
No	1	0	1	0.496
Yes	32	15	47	
Duration of living in orphanages				
<5 years	21	9	30	0.809
>5 years	12	6	18	
History of hemodialysis				
No/Never	33	15	48	NA
Yes	0	0	0	
History of blood transfusion				
No	30	14	44	0.778
Yes	3	1	4	
History of receiving injections				
No	6	2	8	0.676
Yes	27	13	40	
History of dentist visits				
No	26	12	38	0.623
Yes	7	3	10	
History of hospitalization				
No	28	12	40	0.485
Yes	5	3	8	
History of using the same toothbrush				
No	30	2	32	0.000
Yes	3	13	16	
History of using the same nail clipper				
No	31	4	35	0.000
Yes	2	11	13	
History of using the same shaver				
No	30	2	32	0.000
Yes	3	13	16	
History of undergoing a surgery				
No	32	15	47	0.688
Yes	1	0	1	

HbsAg: Hepatitis B surface antigen.

Discussion

Some previous studies done have shown quite similar results, stating that alternating the same personal belongings such as toothbrushes, shavers, and nail clippers has a significant value related to the status of Hepatitis B infection [30], [31], [32].

Table 3: A multivariable analysis on the risk factors of hepatitis B transmission of orphanage residents in Kupang municipality 2019

Variables	B	Sig.	Exp(B)
Sharing a nail clipper	0.225	0.901	1.252
Education	0.844	0.210	2.325
Sharing a toothbrush	2.538	0.035	12.658
Sharing a shaver	2.538	0.035	12.658
Constant	-8.188	0.000	0.000

Talaat concludes that some factors that are significantly correlated to the history of Hepatitis B infection are a history of receiving injections, drug use, having household contact with infected patients, a history of being exposed to invasive medical procedures, and being a military member [33]. On the other hand, Ozer *et al.* presume that people who have a history of hemodialysis or living together with a positively infected patient (such as a spouse, parents, or siblings) have the highest risk of being transmitted the HBV [31].

Meanwhile, Sali *et al.*, who carried out research into the same subject in Iran, reveals that, from 550 case samples and 434 controlled samples, a number of factors, such as age, sex, marital status, history of having contact with patients, free sex activities, drug injection use, history of a major surgery, history of dental visits, and having certain occupations (police, barber, and driver), show a very close relation with the high risks of Hepatitis B infection [34].

Surprisingly, a history of hemodialysis, blood transfusion, getting injections, dental visits, hospitalization, and undergoing a surgery do not have a significant relationship with the contagion of the HBV. It seems like the causes of the different results above are due to the research population. The samples of the research are mostly children and teenagers with education levels ranging from elementary school to high school. In general, people in these age groups tend to have a lower chance to experience such healthcare history of hemodialysis, blood transfusion, getting injections, hospitalization, or undergoing a surgery [35]. Similarly, there is no remarkable correlation between medical treatment and Hepatitis B infection [30]. However, some studies show that the correlation is significantly present Sali *et al.* (2005) considering the fact that the respondents are above 16 years old [34].

Horizontal transmission of the HBV is responsible for about half of HBsAg in Taiwan. A comparison is made between a HBsAg seronegative mother to an HBsAg carrier child compared to a seronegative child. Factors affecting the transmission

are the number of family members, age when starting kindergarten level, frequency of intramuscular injections during infancy and early childhood, contact with HBsAg infected persons, and parents' and siblings' HBV statuses [36]. HBsAg represents a significant prognostic marker in means of disease outcome, not only in the natural history but also during the antiviral treatment of chronic HBV infection [10].

A history of receiving an injection is proven to have a strong relationship with the HBsAg infection status [33]. Dental checkups and receiving invasive measurements in dental care are of a high risk of Hepatitis B and C spread [32].

It is clear that inadequacy of basic necessities and food supply has been the main cause of Hepatitis B transmission in orphanages. It is then suggested that the government should pay more attention to the orphanages and give vaccinations and HBO immunizations free of charge to the 295 other residents who are not infected.

Another contributory factor to the Hepatitis B transmission is occupying a room shared by 10–20 people. That is why meeting the daily needs of orphanage children is of high importance since the insufficiency of personal items such as toothbrushes, nail clippers, shavers, towels, and soap has made them share those items for quite a long period of time. This has consequently led to the higher risk of virus transmission.

Most of the 310 participants interviewed during the research admitted that they did not have their own toothbrushes and most males had to share a shaver with their roommates. The lack of financial support has been the leading cause of fulfilling their needs, and this has subsequently forced the children to share their personal items.

Some further information gathered from interviews with the management of the orphanages reveals that the local government has never undertaken preventive programs such as regular vaccinations and medical checks, sanitary information day, and initial health screening before a child is accepted into an orphanage. This research has some limitations that need to be addressed. Since only the ELISA test was used for the detection of HBV antibodies without confirmatory testing, the results and the conclusions should be interpreted with caution. Moreover, the research included a relatively small number of participants. Despite these limitations, this research gives new insights for this infection in our country.

Conclusion

Vaccinations for orphanage children are extremely essential, especially for those who are not

infected with HBsAg (295 respondents). Besides, the fulfillment of basic necessities of the orphanage residents should be the main concern in order to diminish the risks of Hepatitis B transmission.

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