

Jurnal Riset Kesehatan, 14 (1), 2025, 17 - 22

DOI: 10.31983/jrk.v14i1.9342

Jurnal Riset Kesehatan

http://ejournal.poltekkes-smg.ac.id/ojs/index.php/jrk

# THE EFFECT OF BLOOD TRANSFUSION ON THE RISK OF HEPATITIS B INFECTION IN HEMODIALYSIS PATIENTS : META ANALYSIS

### Yuli Astutia\* ; Yulia Lantib ; Bisma Murtic

<sup>a</sup> Jenderal Achmad Yani Yogyakarta University ; West Ringroad Road, Gamping Kidul, Ambarketawang, Kec. Gamping, Sleman Regency ; Yogyakarta and 55294 ; Indonesia

<sup>b</sup> Sebelas Maret University ; Kentingan, Ir Sutami Street No. 36, Jebres, Jebres District ; Surakarta and 57126 ; Indonesia

<sup>c</sup> Sebelas Maret University ; Kentingan, Ir Sutami Street No. 36, Jebres, Jebres District ; Surakarta and 57126 ; Indonesia

### Abstract

Background Hepatitis B is caused by infection with the Hepatitis B virus, this disease affects 240-280 million people in the world. Hepatitis B virus causes chronic disease that develops in liver damage, cirrhosis and liver cancer, more than 600,000 people die every year. Giving repeated blood transfusions increases a person's risk of developing hepatitis infection. Hemodialysis patients who receive blood transfusion therapy are more at risk of developing hepatitis infection. Objective of this study was to study and estimate the influence of blood transfusion history on the risk of hepatitis B infection in hemodialysis patients based on the results of previous similar studies by meta-analysis. Method is a meta-analysis conducted by searching for articles from the databased Google Scholar, PubMed, Springer Link, and Research Gate. The keywords used were "blood transfusion" OR "risk factor" AND "HBV" OR "hepatitis B infection" OR "TTI" AND "patient hemodyalysis" OR "Patient renal failure". The inclusion criteria in this study were full text articles, from 2000-2020, with a cross sectional study design. Article analysis using RevMan 5.3. Results of data analysis studies 6 articles in the forest plot, giving blood transfusions was able to increase the incidence of hepatitis B infection in hemodialysis patients 1.30 times more at risk than those who did not transfuse, statistically significant (aOR 1.30; 95% CI = 1.02-1.66; p = 0.03) and based on the funnel plot, there was no publication bias. Conclusion blood transfusion affects hepatitis B infection in hemodialysis patients.

Keywords: Blood transfusion, Hemodialysis patient, Meta-Analysis

# 1. Introduction

In the 2010 Global Burden of Disease study, hepatitis B infection tops the list of top health priorities and is the tenth leading cause of death (780,000 deaths annually). Hepatitis B infection is transmitted mostly through infected blood or other body fluids. Modes of transmission include vertical transmission (mother-to-child), sexual transmission, unsafe injection, and blood transfusion (Yang, 2015).

Based on the results of research which states that the level of exposure to Hepatitis B is high due to the use of blood transfusions, the risk of transmission of transmission through blood transfusions is 500,000 out of 2,000,000 who perform blo There are five types or categories of hepatitis, are hepatitis A, B, C, D and

\*) Corresponding Author (Yuli Astuti)

Email: yulitbd.unjani@gmail.com

E. These five types of hepatitis are of greatest concern because they cause potential death, potential spread, and epidemic spread. In

particular, types B and C cause chronic disease in hundreds of millions of people and both types are the most common causes of cirrhosis and liver cancer (WHO, 2020).

Hepatitis B caused by hepatitis B virus infection (hepatitis B) attacks 240-280 million people in the world, Hepatitis B virus causes chronic disease that develops in liver damage, cirrhosis and liver cancer. More than 600,000 people die each year due to hepatitis B virus infection since the initial infection (Pereira, et al., 2017).

The positive prevalence of hepatitis B infection varies from country to country. Around 0.5% in some developed countries to 8% in some Asian countries. The regions in the world with the highest endemicity in the world are the African region and the Western Pacific region with values of 8.8% and 5.3%, respectively, and the lowest endemicity is the United States (Kim, 2005).

Based on the results of research which states that the level of exposure to Hepatitis B is high due to the use of blood transfusions, the risk of transmission of transmission through blood transfusions is 500,000 out of 2,000,000 who perform blood transfusions (Engle, 2014).

Blood transfusion is one of the actions to save or cure patients with human blood without any commercial purpose. This blood transfusion is very risky for transmitting infectious infections through blood transfusions, including hepatitis B, hepatitis C, syphilis and HIV-AIDS. This blood transfusion service needs strict supervision from donor recruitment, donor selection, blood collection, processing of blood component products to safe blood to be transfused (PMK 91 Tahun 2015).

The use of repeated blood transfusions has been proven to increase the risk of transmitting infectious infections through blood transfusions, one of which is hepatitis B infection. A person is advised to carry out routine health checks to avoid transmission of infectious infections through blood transfusions (Nkrumah, 2011).

Hemodialysis patients are one of the groups of people who are at risk for transmission of hepatitis infection, because these patients receive repeated transfusion therapy 8. There are five types or categories of hepatitis, are hepatitis A, B, C, D and E. These five types of hepatitis are of greatest concern because they cause potential death, potential spread, and epidemic spread. In particular, types B and C cause chronic disease in hundreds of millions of people and both types are the most common causes of cirrhosis and liver cancer (WHO, 2020).

# 2. Method

### a. Design Research

This study uses a research design, with literature study and meta-analysis. Meta-analysis is a research study design that examines systematically (systematic review) and combines the results of quantitative estimates (meta-analysis) from a number of previous studies that answer the same research problem and can be combined. Meta-analysis not only combines data indirectly, but also conducts epidemiological exploration and evaluates results, research findings replace individuals as units (Murti, 2016).

# b. Location and Time of Research

This research was conducted by searching and selecting literature/journal articles across races, ethnicities and locations around the world. The research time in the search for literature/journal articles is the period 2000-2020, which is relevant to the topic to be analyzed, so the literature is included. Articles that were selected and found using electronic data base media include: Google Scholar, PubMed, Research Gate, Scopus, Springer Link, and Science direct. The keywords used in the article search were "blood transfusion" OR "risk factor" AND "hepatitis B infection" OR "TTI" OR "HBV" AND "patient hemodialysis" OR "Patient renal failure".

# c. Population and Sample

The population and sample in this study were hemodialysis patients.

# d. Data Collection Techniques

Collecting data in this study through the following steps:

### 1. Formulating the Research Problem

The first step in conducting this research is to formulate a research problem, the formulation of this research problem using the PICO technique. PICO in this study are:

a) Population: hemodialysis patients

- b) Intervention: Blood transfusion
- c) Comparison: No blood transfusion
- d) Outcome: Hepatitis B infection
- 2. Create Inclusion Criteria
- a) The article is available in full text, with a cross sectional study design.
- b) Selected and analyzed articles that examine or discuss risk factors for hepatitis B and hepatitis C infection (blood transfusion history) in the hemodialysis patient group.
- c) Articles published in English.
- d) Research sample 100 samples.
- e) The selected articles are those who perform data analysis in the form of multivariate analysis.
- f) The selected articles are those that display the final results of the adjusted odds ratio (aOR) study.
- 3. Create Exclusion Criteria
- a) The excluded articles were articles that used RCT research studies. Case control, quasi experimental, and study protocol.
- b) Articles published in languages other than English.
- c) The results reported in the study are bivariate analysis, so that only OR, percent, mean difference and the like are shown.
- 4. Article Searching

The search for articles was carried out by searching for articles that examined risk factors (history of blood transfusions) on the incidence of hepatitis B infection and hepatitis C infection in hemodialysis patients, both female and male patients. Search articles through electronic databases, including: Google Scholar, PubMed, Research Gate, Scopus, Springer Link, and Science direct.

5. Assessing the Quality of Study

The author conducts research quality with critical appraisal. A study must be assessed by critical appraisal or research evidence. The assessment tool can also be used when creating Critical Appraised Topics (CAT). The following is the assessment instrument according to (Moola, 2017):

- a) What the criteria for inclusion in the sample clearly defined?
- b) What is the research subject and background explained in detail?
- c) What is exposure measured by a valid and reliable instrument?
- d) What is in the objective, using standard measurement criteria in accordance with the conditions?
- e) Are confounding factors identified?
- f) Are strategies for resolving confounding factors stated?
- g) What the measuring instrument used to measure the outcome valid and reliable?
- h) Was the statistical analysis used appropriate?
- i) Combining Results

The results of the articles that have been obtained are made qualitative and quantitative analysis. The results that have been recorded and processed will be drawn a conclusion in accordance with the formulation and research objectives. The application that will be used to help process data in quantitative form is to use Review Manager (RevMan) 5.3 software released by the Cochrane Collaboration. The results of the analysis will show a large effect value, 95% confidence interval (CI) and also I<sup>2</sup> or data heterogeneity. The steps of this research can be seen in the PRISMA flow diagram.

6. Processing and Data Analysis

This research will analyze the data using Rev-Man 5.3 software. At this stage of analysis consists of two different parts. The first part deals with information related to the characteristics that describe the primary study, the second with the correct analysis of the synthesis results. The main analysis of the meta-analysis is a description of the magnitude of the effect obtained. Large effect analyzes are integrated, combined and compared usually in three sets. First, a single joint estimate of the effect size, is usually the inverse of the variance estimate: as this variance is an inverse function of the effect size. Second, to study and test for homogeneity, this test is to determine whether the statistics are

better analyzed by fixed effects or random effects. Third, control for heterogeneity. The results will be seen in the forest plot (Moola, 2017).

### 3. Result and Discussion

The process of searching for articles by searching through journal databases which include: PubMed, SpringerLink, Research Gate, Elsevier, Science Direct and Google Scholar. The keywords used included: "blood transfusion" OR "risk factor "AND "hepatitis B" OR "HBV" OR "transmitted transfusion infections" AND "Among patient hemodialysis" OR "Patient renal failure" AND "cross sectional". The article review process can be seen in the search flow as follows:



Figure 1: Prisma Flow Diagram

Articles that were meta-analyzed had good scores above 11 out of a total score of 13. After the feasibility assessment was carried out, the articles were meta-analyzed using the help of Rev Man 5.3. The results were in the form of forest plots and funnel plots below:

				Odds Ratio	Odds Ratio
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Fereirra et al., 2006	0.8329	0.1852	16.2%	2.30 [1.60, 3.31]	
Gasim et al., 2011	-0.1054	0.1282	20.1%	0.90 [0.70, 1.16]	+
Paniagua et al., 2010	0.009	0.0149	25.6%	1.01 [0.98, 1.04]	•
Purnamasidhi et al., 2016	0.9123	0.3355	8.8%	2.49 [1.29, 4.81]	_ <b>_</b>
Tozun et al., 2015	0.2624	0.4389	6.0%	1.30 [0.55, 3.07]	<del></del>
Zaki et al., 2014	0.2263	0.0781	23.3%	1.25 [1.08, 1.46]	-
Total (95% CI)			100.0%	1.30 [1.02, 1.66]	◆
Heterogeneity: Tau <sup>2</sup> = 0.06; Chi <sup>2</sup> = 35.10, df = 5 (P < 0.00001); l <sup>2</sup> = 86%					
Test for overall effect: Z = 2.16 (P = 0.03)					tidak tranfusi darah tranfusi darah

Figure 2: Forest plot of blood transfusion on the incidence of hepatitis B infection

Based on the results of the analysis in Figure 2 above, it can be seen that as many as 6 articles reported that blood transfusion was one of the risk factors that influenced the incidence of hepatitis B infection in hemodialysis patients. Meanwhile, there was high heterogeneity between primary studies

 $(I^2=86\%; p<0.00001)$ . This, the Random Effect Model is used. In data analysis in the forest plot, blood transfusion was able to increase the incidence of hepatitis B infection in hemodialysis patients 1.30 times more at risk than those who did not transfuse, statistically significant (aOR 1.30; 95% CI=1.02-1.66; p=0.03). A funnel plot is a plot that depicts the approximate size of the effect of each study on the estimate of its accuracy which is usually the standard error.



Figure 3: Funel plot of the effect of blood transfusion on hepatitis B infection

Based on Figure 3, the funnel plot of the effect of blood transfusion on hepatitis B infection shows that there is no publication bias, which is indicated by the symmetry in terms of the distance between the primary studies on the right and left of the funnel plot.

Based on the results of the forest plot, it showed that blood transfusion could increase the incidence of hepatitis B infection by 1.30 times compared to those who did not receive transfusion in hemodialysis patients and statistically significant (p=0.030). Hemodialysis patients who received transfusion therapy according to stated that they were included in the group at high risk for hepatitis B infection. in hemodialysis patients will increase the risk for hepatitis B infection (Prakash, 2012).

Hepatitis B is transmitted through exposure to infectious blood or body fluids containing blood through a puncture of the skin or through direct contact with mucous membranes. Hepatitis B virus is the most contagious virus compared to other viruses that are transmitted through blood. Immunity is an important role used to fight the hepatitis B virus, hemodialysis (HD) patients are more likely to experience immunosuppression, this can make them susceptible to contracting the hepatitis B virus. Many studies report that hepatitis B infection is found in hemodialysis patients during the transfusion process repeated (Fabrizi, 2020).

A history of repeated blood transfusions increases exposure to viruses that are transmitted through the transfusion process that is transmitted from a donor to a patient, namely one of the viruses that can be infected is the virus that causes hepatitis B infection. Adequate transfusion services are needed in hemodialysis patients, and screening needs to be considered. against infectious infections through blood transfusions of blood to be transfused so that the risk of transmission of hepatitis B infection can be minimized (Tajbaksh, 2020).

The risk of blood transfusion for hepatitis B infection in hemodialysis patients other than the blood products to be transfused, is the transfusion process itself. During the transfusion process, there can be transmission of transmission caused by the used needles and unskilled health workers. The use of machines during the hemodialysis process. This needs to be considered so that the transmission of hepatitis B infection can be minimized Lopez, 2005).

### 4. Conclusion and Suggestion

Based on the results of a meta-analysis conducted by researchers in 6 primary studies from Turkey, Egypt, Sudan, Mexico, Brazil, and Indonesia, it can be concluded that hemodialysis patients with a history of blood transfusions have a 1.30 times risk of developing hepatitis B infection compared to those who do not undergo transfusion. blood (aOR=1.30; 95% CI=1.20 -1.66; p=0.030).

### 5. References

Engle R, Bukh J, Alter H, Emerson S, Trenbeath, Nguyen, Purcell RH. (2014). Transfusion-associated hepatitis before the screening of blood for hepatitis risk factors. Transfusion J, 54(11), 2833–2841.

- Fabrizi F, Cerruti R, Riduejo E. (2019). Hepatitis B Virus Infection as a Risk Factor for Chronic Kideny Disease. ERCP, 12; (9), 1751-2441.
- Jia J, Li Y, Wei C, Guo R, Xu H, Jia Y, Gao X. (2019). Factors associated with disease progression and viral replication in patients with chronic hepatitis B virus infection. Exp Ther Med, 20: (5), 4730-4740.
- Kim A, Sammy S. (2005). Treatment of hepatitis C. Am J Med, 118: (8), 808-815.
- Lopez L, Patricia L, Arago A, Rodiguez I, Jorge, Lima E, Insagaray J, Bentancor N. (2005). Risk factor for hepatitis B and C in Multi-tranfused patient in Urugay. Journal of Clin Virol, 34 (2), S69-74.
- Moola S, Munn Z, Tufanaru C, Aromataris E, Sears K, Sfetcu R, Currie M, Qureshi R, Mattis P, Lisy K, Mu P-F. (2017). Chapter 7: Systematic reviews of etiology and risk . In: Aromataris E, Munn Z (Editors).mJoanna Briggs Institute Reviewer's Manual. The Joanna Briggs Institut.
- Murti B. 2016. Prinsip dan Metode Riset Epidemiologi. Colomadu, Karanganyar. Bintang Fajar Offset.
- Nkrumah, Owusu, Frempong, Averu. (2011). Hepatitis B and Hepatitis C Viral Infections Among Blood Donors From rural Ghana. Ghana Med J,45(3), 97-100.
- Peraturan Menteri Kesehatan (PMK) No. 91 Tahun 2015 tentang Standar Pelayanan Transfusi Darah.
- Pereira VR, Wolf JM, Luz CA, Stumm, Boeira T, Galvan J, Lunge VR. (2017). Risk factors for hepatitis B transmission in South Brazil. SciELO, 112(8), 544–550.3. Ahrens W, Pigeot I. Handbook of Epidemiology. 2nd ed. New York: Springer; 2014.
- Prakash S, Jain A, Sankwar S, Usman K, Saha D, Singh, Jain P, Singh K. (2012). Prevalence of hepatitis B and C viruses among patients on hemodialysis in Lucknow, Utar Pardesh. CEGH, 1 (2), 19-23.
- Tajbaksh R. (2020). Prevalence of Hepatitis C and B Viruses Infection among Hemodialysis Patient in Karaj, Iran. Saudi J Kidney Dis Transpl;26 (4):792-796.
- Yang S, Wang D, Zhang Y, Yu C, Ren J, Xu K, Li L. (2015). Transmission of Hepatitis B and C Virus Infection Through Body Piercing. Medicine, 94(47), e1893.
- WHO. (2020). Clinical Transfusion Practice Guidelines for Medical Interns. diunduh di https://www.who.int/bloodsafety/transfusion\_services/ClinicalTransfusionPracticeGuidelines forMedicalInternsBangladesh.pdf pada tanggal 19 Juli 2020.