

RELATIONSHIP BETWEEN OCCUPATION AND REACTIVE HBSAG TTI SCREENING IN DONORS AT THE INDONESIAN RED CROSS IN MAKASSAR CITY IN 2022-2023

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ABSTRAK

Hepatitis B adalah masalah kesehatan global utama yang mematikan dengan resiko penularan salah satunya melalui darah. Sehingga, upaya pengamanan darah dilakukan dengan uji saring terhadap Infeksi Menular Lewat Transfusi Darah (IMLTD). Penelitian ini bertujuan untuk menganalisis hubungan antara jenis pekerjaan dengan hasil uji saring IMLTD reaktif terhadap HBsAg pada pendonor di Unit Transfusi Darah PMI Kota Makassar tahun 2022–2023. Penelitian ini menggunakan desain deskriptif analitik cross-sectional dengan memanfaatkan data sekunder dari 665 pendonor sukarela yang hasil uji saring IMLTD reaktif terhadap HBsAg di Unit Transfusi Darah Palang Merah Indonesia Kota Makassar dalam kurun waktu 2022-2023. Analisis data untuk menguji hubungan antara variabel pekerjaan dan hasil IMLTD HBsAg reaktif dilakukan menggunakan Uji Chi-Square. Hasil penelitian menunjukkan adanya hubungan yang signifikan antara pekerjaan dengan hasil IMLTD pendonor HBsAg reaktif dengan nilai $p = 0,018$ ($p < 0,05$). Temuan ini mengindikasikan bahwa jenis pekerjaan dapat berperan sebagai faktor risiko terhadap kemungkinan paparan atau infeksi terhadap virus hepatitis B.

ABSTRACT

Relationship between Occupation and Hepatitis B Reactivity in Donors at The Indonesian Red Cross in Makassar City in 2022-2023. Hepatitis B is a major global health problem that is deadly, with the risk of transmission being through blood. Therefore, blood safety efforts are carried out by screening for Transfusion-Transmitted Infections (TTI). This study aims to analyze the relationship between occupational type and reactive TTI screening results for HBsAg in donors at the Indonesian Red Cross Blood Transfusion Unit in Makassar City in 2022–2023. This study used a cross-sectional analytical descriptive design utilizing secondary data from 665 voluntary donors whose TTI screening results were reactive to HBsAg at the Indonesian Red Cross Blood Transfusion Unit in Makassar City in the period 2022–2023. Data analysis to examine the relationship between occupational variables and reactive TTI results was performed using the Chi-Square Test. The results showed a significant relationship between occupation and reactive TTI results of HBsAg donors with a p-value of 0.018 ($p < 0.05$). These findings suggest that occupational type may act as a risk factor for possible exposure to or infection with the hepatitis B virus.

INTRODUCTION

Hepatitis B is a major global health problem, with 61 million people infected in the WHO South-East Asia Region. Deaths from viral hepatitis increased from 1.1 million in 2019 to 1.3 million in 2022. Hepatitis B caused approximately 1.1 million deaths (83% of all deaths from viral hepatitis). The 2022 Global Hepatitis Report indicates that the total number of hepatitis B and C infections in Indonesia, across all age groups, is 18,900,000 (6.2%), comprising 17,500,000 (6.9%) cases of hepatitis B and 1,400,000 (2.8%) cases of hepatitis C. The 2023 Indonesian Health Survey revealed that the prevalence of hepatitis B, based on reactive HBsAg titers, was 2.4%.^{1,2,3}

Hepatitis B virus (HBV) is primarily transmitted through blood; therefore, patients with a history of blood transfusions or hemodialysis are at a high risk of infection. Furthermore, occupational exposure can also increase the risk of transmission. Healthcare workers and public safety officers, as well as those in occupations that pose a risk of exposure to blood or body fluids, can increase the risk of hepatitis B virus transmission. Therefore, thorough screening for transfusion-transmitted infections (TTI), including HBV, must be performed to ensure the safety of each donor's blood before blood is distributed for transfusion.^{4,5}

Blood Transfusion Transmitted Infections (TTI) are the transmission of pathogens present in donor blood to the patient during a blood transfusion. Pathogens that can be transmitted from donor blood to the patient include viruses, bacteria, parasites, and other pathogens. Blood Transfusion Transmitted Infection (TTI) screening is performed to prevent the risk of infection transmission from donor to recipient. The TTI screening test, which is performed to detect hepatitis B infection, tests for Hepatitis B Surface Antigen (HBsAg).^{6,7}

Previous research conducted by Nadia (2024) described the percentage of donors with reactive HBsAg results across occupational groups in a specific region. However, this study was limited to descriptive data presentation and did not conduct a correlation analysis to determine whether there was a significant relationship between donor occupation and HBsAg reactivity. Therefore, this study aims to determine the relationship between occupation and reactive hepatitis B TTI screening results in donors at the Indonesian Red Cross (PMI) UTD in Makassar City in 2022-2023.⁸

Based on this background, the researchers conducted a study entitled "Analysis of the Relationship Between Work and Reactive Hepatitis B Transfusion-Transmitted Infection Screening Results in Donors At The Indonesian Red Cross In Makassar City in 2022-2023".

METHOD

This research is a descriptive analytical study. This retrospective study employs a cross-sectional design, utilizing medical record data from voluntary donors who received reactive TTI Hepatitis B screening results at the Indonesian Red Cross in Makassar City between 2022 and 2023. The sample was obtained using a total sampling technique. This study employed inclusion and exclusion criteria. The inclusion criteria include (1) Voluntary Blood Donors, (2) Reactive HBsAg TTI screening test results. Meanwhile, the exclusion criteria are Donors with a previous history of hepatitis B. The research variables consist of independent variables, namely the donor's occupation recorded in the donor's medical record, then grouped into 4 groups based on the grouping according to job classification, namely (1) Indonesian National Armed Forces/Police, (2) Professionals & Service/Trade Business Personnel, (3) Unskilled/Skilled Agricultural & Fisheries Workers, and (4) Students. The dependent variable is the result of the HBsAg reactive TTI screening

test, which consists of two examinations: the first examination and a re-examination. The re-examination is carried out on samples that are reactive in the first examination as a confirmation test.

The data obtained then underwent univariate analysis to describe the characteristics of the study sample, including age grouped into the age ranges of 20-34 years, 35-44 years, 45-44 years, and 55-64 years; gender; donor type, divided into voluntary donors and replacement donors; and region of origin. Bivariate analysis was also conducted to examine the relationship between the two variables using the Chi-Square test in SPSS (Statistical Package for the Social Sciences).

This study has obtained ethical approval from the Research Ethics Committee of the Faculty of Medicine, Muslim University of Indonesia No: 638/A.1/KEP-UMI/VIII/2025, and permission from the Indonesian Red Cross of Makassar City. Participation is voluntary, and respondents' identities will be strictly confidential.

RESULTS

Based on the research conducted, it was discovered that the method used in the TTI screening test at the Indonesian Red Cross in Makassar City was *chemiluminescence immunoassay* (ChLIA). The research results are as follows.

1.1. Characteristics of Donors with Reactive HBsAg TTI Results

Table 1. Characteristics of Donors with Reactive HBsAg TTI Screening Test Results

Data Characteristics	Years	
	2022	2023
	N (%)	N (%)
Number of Donors	378 (100)	354 (100)
Age		
20-34	161 (42,59)	147 (41,53)
35-44	99 (26,19)	112 (31,64)
45-54	96 (25,40)	77 (21,75)
55-64	22 (5,82)	18 (5,08)
Gender		
Male	276 (73,02)	237 (66,95)
Female	102 (26,98)	117 (33,05)
Donor Types		
Voluntary donors	352 (93,12)	313 (88,42)
Replacement donors	26 (6,88)	41 (11,58)
Region of Origin		
Makassar	295 (78,04)	263 (74,29)
Gowa	33 (8,73)	27 (7,63)
Maros	26 (6,88)	27 (7,63)
Pangkep	3 (0,79)	8 (2,26)
Palopo	2 (0,53)	-
Jeneponto	2 (0,53)	4 (1,13)

`Data Characteristics	Years	
	2022	2023
	N (%)	N (%)
Barru	2 (0,53)	1 (0,28)
Takalar	2 (0,53)	2 (0,56)
Pare-Pare	1 (0,26)	1 (0,28)
Sinjai	1 (0,26)	2 (0,56)
Bulukumba	1 (0,26)	-
Bone	1 (0,26)	-
Enrekang	-	1 (0,28)
Wajo	-	2 (0,56)
Outside South Sulawesi	9 (2,54)	16 (4,52)

Based on the results, it is known that the number of donors at the Indonesian Red Cross in Makassar City during 2022-2023 was 81,357, and among them, 732 people (0.90%) had reactive TTI HBsAg screening test results, divided into 378 (51.64%) people in 2022 and 354 (48.36%) people in 2023. Most of the donor characteristics included being between the ages of 20 and 34, male gender, voluntary donor type, and originating from the Makassar area.

1.2. Number of Donors with Reactive TTI HbsAg Results in the First and Second Examination Based on Occupation

Table 2. Number of Reactive HBsAg Donors at First Examination based on Occupation

Donor Occupation Type	Reactive HBsAg Count in First Examination			
	2022		2023	
	N	%	N	%
Number of Donors	352	100	313	100
Indonesian National Army / Police				
• Army	40	11,36	6	1,92
• Police	4	1,14	10	3,19
Professionals and Service/ Trade Business Personnel				
• Private Sector Employees	59	16,76	49	15,65
• Civil Servants	25	7,10	26	8,31
• BUMN	25	7,10	11	3,51
• Doctors	1	0,28	1	0,32
• Teachers	33	9,38	49	15,65
• Retired Employees	8	2,27	12	3,83
Unskilled/ Skilled Agricultural & Fishery Workers				
• Farmers	2	0,57	-	-
• Laborers	1	0,28	1	0,32
• Entrepreneurs	24	6,82	26	8,31
• Traders	3	0,85	1	0,32
• Fishermen	17	4,83	18	5,75
• Housewives	36	10,23	39	12,46
Students				
• University Students	69	19,60	63	20,13
• Students	5	1,42	1	0,32

The study results showed that 352 voluntary donors had reactive HBsAg TTI results during the first examination in 2022, and 313 donors in 2023. Table 2 shows that the highest number of reactive HBsAg in each group was Indonesian National Armed Forces (army) with a total of 46 individuals, followed by 108 private sector employees, 75 housewives, and 132 students.

Table 3. TTI HBsAg Results of Donors on Re-Examination based on Occupation

Donor Occupation Type	TTI HBsAg Re-examination Results			
	2022		2023	
	Non Reactive N (%)	Reactive N (%)	Non Reactive N (%)	Reactive N (%)
Number of Donors	49 (13,92)	303 (86,08)	25 (7,99)	288 (92,01)
Indonesian National Army / Police				
• Army	13 (32,50)	27 (67,50)	-	6 (100)
• Police	-	4 (100)	-	10 (100)
Professionals and Service/ Trade Business Personnel				
• Private Sector Employees	9 (15,25)	50 (84,75)	5 (10,20)	44 (89,80)
• Civil Servants	3 (12)	22 (88)	4 (15,38)	22 (84,62)
• BUMN	5 (20)	20 (80)	2 (18,18)	9 (81,82)
• Doctors	1 (100)	-	1 (100)	-
• Teachers	-	33 (100)	1 (2,04)	48 (97,96)
• Retired Employees	-	8 (100)	-	12 (100)
Unskilled/ Skilled Agricultural & Fishery Workers				
• Farmers	-	1 (100)	-	1 (100)
• Laborers	2 (8,33)	22 (91,67)	3 (11,54)	23 (88,46)
• Entrepreneurs	-	3 (100)	-	1 (100)
• Traders	1 (5,88)	16 (94,12)	-	18 (100)
• Fishermen	4 (11,11)	32 (88,89)	2 (5,13)	37 (94,87)
• Housewives				
Students				
• University Students	8 (11,59)	61 (88,41)	7 (11,11)	56 (88,89)
• Students	3 (60)	2 (40)	-	1 (100)

Table 3 shows the results of the double examination with high reactive consistency, namely 303 donors (86.08%) in 2022 and 288 donors (92.01%) in 2023. In addition, the largest number of non-reactive results after re-examination was found in army jobs compared to other jobs, namely 13 donors (32.50%) of the total number of donors with army jobs in 2022.

1.3. Relationship between Donor Occupation and Reactive HbsAg TTI Results

Table 4. Relationship between Occupation and Reactive HBsAg TTI Results in 2022-2023 Using Chi-Square Test

Donor Occupation Type	HBsAg TTI Screening results for 2022-2023						P -value
	Non Reactive		Reactive		Total		
	N	%	N	%	N	%	
Indonesian National Army / Police	13	21,67%	47	78,33%	60	9,02%	
Professionals and Service/ Trade Business Personnel	31	10,37%	268	89,63%	299	44,96%	
Unskilled/ Skilled Agricultural & Fishery Workers	12	7,14%	156	92,86%	168	25,25%	
Students	18	13,04%	120	86,96%	138	20,75%	
Total	74	11,13%	591	88,87%	665	100,00%	0,018

The results of the data analysis showed a statistically significant relationship between the two research variables with a p-value of 0.018 ($p < 0.05$). This finding suggests that the type of work can be a risk factor for potential exposure or infection with the hepatitis B virus, as detected through the Hepatitis B Surface Antigen (HBsAg) examination in the Transfusion Transmitted Infections (TTI) screening test.

DISCUSSION

Based on the research results, donors with reactive HBsAg TTI screening results were predominantly aged 20-34 (42.08%), male (70.08%), voluntary donors (90.58%), and located in the Makassar area (74.29%). These findings align with research by Maharani R. (2023), which showed that individuals aged 25-44 had a higher rate of reactive HBsAg TTI results compared to other age groups. Furthermore, the study also showed a higher prevalence of reactive HBsAg in male donors than in female donors, and in voluntary donors compared to replacement donors.⁹

Adolescents and young adults are a productive age group with normal physical conditions, thus meeting the requirements for blood donation. Therefore, the majority of TTI results are met by this age group. Furthermore, the higher incidence of hepatitis B infection at this age is due to susceptibility to risk factors, such as the use of contaminated needles and sexual contact with infected individuals.¹⁰

Hepatitis B virus infection is more common in men than in women due to several factors, including hormonal differences, varying activity levels, and different social interactions. The differences in male and female hormones in the release of inflammatory cytokines have been found to indicate that women who are hepatitis carriers have a lower viral load than men. Activities undertaken by men, such as working outside the home, getting haircuts, and donating blood, can increase their susceptibility to HBV infection. Furthermore, risky social interactions, such as having multiple sexual partners, intravenous drug use, and racial and ethnic differences, contribute to differences in lifestyles between men and women. In addition to gender, geo-epidemiological

studies indicate that areas with high population density can influence the incidence of hepatitis B.^{10,11,12,13}

Based on the research results, the majority of donors who were HBsAg reactive in the initial examination were reactive again in the double examination. The reactive results were mostly found in students, private sector employees, and the Indonesian National Armed Forces. This finding aligns with research by Widia R (2021), which reports the highest prevalence of HBsAg-reactive TTI results based on occupation, with the majority of cases occurring among private sector employees and members of the Indonesian National Armed Forces.¹⁴

Based on the testing and handling of TTI screening results, donor blood with reactive screening results may not be used for transfusion. "Reactive" means that donor blood is suspected of being infected based on one blood screening test (Initial Reactive) at a Blood Transfusion Unit with a limited quality system or based on repeated reactive results at a Blood Transfusion Unit with an effective quality system.⁶

Non-reactive results are also obtained in duplicate tests, even though the method and equipment used in the first and second tests are the same. This can be caused by false positives, which may occur during the initial test. Several factors contribute to false positives, including the sensitivity and specificity of the method used, specimen handling that can cause clotting, reaction temperature, reaction time, thoroughness of washing, specimen hemolysis, and the reagents used. Therefore, a repeat test is performed as a confirmatory test for the first test result.^{6,15}

The high reactivity of HBsAg in some occupational groups can be attributed to several factors, including high social mobility that allows for a history of direct contact with individuals infected with the virus in the social environment, as well as a history of intensive blood donation, considering that the majority of donors come from the non-medical sector. Additionally, the lack of access to accurate and relevant health information sources contributes to the level of vulnerability to hepatitis B virus infection. Occupational safety training and adequate health knowledge possessed by medical and health workers are significant protective factors in preventing their vulnerability to hepatitis B virus infection.^{16,17,18}

The high number of non-reactive TTI results among army personnel may be influenced by several strong protective factors. A rigorous initial selection process ensures that only individuals in good health are accepted into the army, thus reducing the prevalence of infection early on. Furthermore, army personnel receive health insurance and undergo regular and periodic health checks, enabling the early detection and prevention of infectious disease transmission. The influence of a disciplined lifestyle, such as limiting alcohol consumption and prohibiting narcotics use, also reduces the risk of virus transmission. Access to safe healthcare and the use of sterile medical equipment are also well-facilitated. Overall, the controlled military environment, high levels of discipline, and a robust internal health system are key factors in the low TTI reactivity rate among army personnel.^{19,20,21}

The study's results revealed a significant correlation between the type of donor's work and TTI results, indicating reactive HBsAg, as indicated by a p-value of 0.018 ($p < 0.05$). Susceptibility to hepatitis B virus infection in several occupational groups is associated with physical stress and work-related fatigue. Stress negatively impacts liver health, where chronic stress causes the immune system's cytokine profile to shift to one mediated by T helper 2 cells, characterized by an increase in IL-10 and a decrease in IFN- γ , which is more immunosuppressive. In addition, chronic stress can increase oxidative reactions that lead to local inflammation, resulting in liver cell damage that promotes mutagenic and carcinogenic mechanisms.^{22, 23}

Stress can trigger the excessive activation of Kupffer cells, the primary macrophages resident in the liver, which serve as the first line of defense against infection and significantly contribute to the body's immune response. Kupffer cells are also crucial for maintaining baseline liver immune tolerance by secreting anti-inflammatory cytokines. However, excessive activation of these cells can lead to liver damage by activating other immune cells (including neutrophils) and producing reactive oxygen species (ROS).²⁴ This study did not collect in-depth information on donors' risky behaviors, such as tattoos or piercings, injection drug use, or risky sexual behavior. This lack of data limits the study's ability to identify a true causal link, allowing only inferences about association.

CONCLUSION

Based on the research results, it can be concluded that there is a significant association between occupation and reactive HBsAg TTI results in donors at the Indonesian Red Cross (PMI) in Makassar City during the 2022-2023 period. Specifically, the dominant reactive occupational groups included students, private sector employees, military personnel, and teachers. These findings emphasize the need for strengthened screening and education targeted at this age group, gender, and at-risk occupation for adult Hepatitis B awareness and vaccination programs. Furthermore, further analytical research is strongly recommended to investigate specific risk factors (such as history of tattoos/piercings and risky sexual behavior) that may underlie this association between occupations.

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