



Prevalence of Hepatitis C in Hemodialysis Patients in Indonesia

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ABSTRACT

Hepatitis C (HCV) is a blood-borne viral infection and a major cause of global morbidity and mortality. Indonesia is one of six countries contributing to 50% of the global HCV burden, with a prevalence of 0.5% in the general population. HCV infection is more frequently observed in patients with chronic kidney disease undergoing hemodialysis due to nosocomial transmission. This study employed a literature review method by searching articles published between 2015 and 2025 in Google Scholar, PubMed, and ProQuest, yielding 11 eligible studies. The analysis shows that the prevalence of HCV among hemodialysis patients in Indonesia ranges from 3.7% to 56.3%, with the highest rate reported at H. Adam Malik General Hospital Medan (56.3%) and the lowest at Banyu Bening Hospital Boyolali (3.7%). Most infected patients are male and over 45 years of age. These variations indicate that male sex and older age serve as risk factors for HCV infection in hemodialysis patients.

1. INTRODUCTION

Hepatitis is an inflammation of the liver caused by viral infection and is associated with significant morbidity and mortality worldwide (Adane and Getawa, 2021). One type of hepatitis that remains a major global health problem is Hepatitis C (HCV). This disease is caused by an RNA virus belonging to the family *Flaviviridae* and the genus *Hepacivirus* (Al Yasin et al., 2024). HCV transmission occurs through blood exposure and is therefore classified as a blood-borne virus (Timofte et al., 2020). The most common modes of transmission involve medical practices associated with blood exposure via needles, such as unscreened blood transfusions, organ transplantation, hemodialysis, intravenous drug use, and sexual practices that allow direct blood contact (Wilson et al., 2022).

HCV transmission among hemodialysis (HD) patients generally occurs through nosocomial routes. Contributing risk factors include inadequate disinfection of equipment between patients, shared use of single-dose infusion vials, improper application of aseptic techniques, use of contaminated dialysis equipment, and healthcare worker-related factors in infection control practices (Raina et al., 2022). Nosocomial HCV transmission in hemodialysis units is closely associated with dialysis equipment use and hygiene practices. Factors such as dialyzer reuse, type of vascular access, and adherence to sanitation and sterilization procedures significantly contribute to an increased risk of HCV infection within hemodialysis units (Kurnia Fitriasari et al., 2025).

In Indonesia, an estimated 5,942 deaths attributable to hepatitis C occur annually (Kemenkes RI, 2023). Indonesia is among the ten countries contributing nearly two-thirds of the global burden of hepatitis B and C and is one of six countries accounting for 50% of the global HCV burden, with approximately 1.4 million infections reported in 2022 (WHO, 2024). According to the WHO Global Hepatitis Reporting System in 2022, the prevalence of chronic HCV infection in Indonesia was 0.5% in the general population, with an estimated 1,392,645 people living with chronic HCV, 39,134 new cases, and 6,322 deaths attributable to chronic HCV infection (WHO,

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2022). Globally, the pooled prevalence of HCV infection among dialysis patients reaches 24.3%, which is approximately 14 times higher than the prevalence in the general population (1.8%) and significantly exceeds the global prevalence in other high-risk groups, such as 0.87% among blood donors, 3.4% among men who have sex with men, 17.7% among prisoners, and 2.4% among people living with HIV (Kenfack-Momo et al., 2024).

The incidence of HCV infection among hemodialysis patients in Indonesia is higher than in the general population and is associated with the duration of hemodialysis treatment (Al Yasin et al., 2024). The 2020 annual report of the Indonesian Renal Registry documented that 18% of hemodialysis patients (6,244 out of 33,942 patients) were infected with HCV (Pernefri, 2020). These findings indicate that HCV remains a serious public health concern in Indonesia, particularly among hemodialysis patients, and warrants greater attention in prevention, screening, and management efforts. However, regional or hospital-level variations remain incompletely characterized due to the lack of homogeneous national data.

To date, no systematic synthesis of evidence regarding the prevalence of HCV infection among hemodialysis patients in Indonesia is available. Data reported by the Indonesian Renal Registry (IRR) do not yet encompass all provinces or all hemodialysis facilities, limiting the representativeness of national prevalence estimates. Moreover, reported HCV prevalence across studies shows substantial heterogeneity, with several earlier reports documenting prevalence rates exceeding 30%. These limitations and data variability underscore the need for research designed to produce more accurate, up-to-date, and representative estimates of HCV prevalence among hemodialysis patients in Indonesia.

This study was conducted in the context of the WHO target for hepatitis C elimination by 2030, which aims for 90% diagnosis coverage and 80% treatment coverage, while Indonesia continues to face limitations in HCV screening within hemodialysis units. As one of the ten countries contributing most significantly to the global burden of hepatitis C, the availability of accurate HCV data among the hemodialysis population is crucial to support both national and global elimination strategies (WHO, 2024). Based on this background, the present study aims to describe the prevalence of HCV infection among hemodialysis patients in Indonesia based on published scientific literature, while also identifying the most frequently examined demographic factors—namely age and sex—associated with HCV infection in this population.

2. METHOD

This study employed a literature review methodology. The literature search was conducted for publications published between 2015 and 2025 using the Google Scholar, PubMed, and ProQuest databases. The search strategy utilized English keywords including “Prevalence,” “Hepatitis C,” “Hemodialysis,” and “Indonesian,” as well as Indonesian keywords including “Prevalensi,” “Hepatitis C,” “Hemodialisis OR Hemodialisa,” and “Indonesia.”

Literature selection was performed using the PICO framework. The study population comprised patients with kidney disease undergoing hemodialysis therapy in Indonesia. The intervention analyzed was the presence of Hepatitis C virus (HCV) infection. Comparisons included data across hospitals or regions in Indonesia, as well as patient characteristics. The outcomes assessed were the prevalence of HCV infection among hemodialysis patients, including its distribution by geographic region, sex, and age group. Subsequently, articles were screened based on predefined eligibility criteria, namely publication years between 2015 and 2025 and the presentation of HCV prevalence data in Indonesia.

3. RESULT AND DISCUSSION

Result

Following the literature search, 11 eligible journals were identified and subsequently analyzed using a literature review approach. The results of the literature review of these 11 journals are presented in the following table 1.

Table 1. Distribution of Hepatitis C Prevalence among HD Patients

Penulis dan Tahun	Center Penelitian	Prevalensi Hepatitis C (Jumlah Responden)
Widhani et al, (2015)	RSUPN Cipto Mangunkusumo Jakarta	38% (65 dari 171)
Liana et al., (2015)	RSUP Dr. Mohammad Hoesin Palembang	6.5 % (6 dari 92)
Utsumi et al., (2016)	4 Unit Hemodialisis privat di Surabaya	37.2% (67 dari 180)
Belung et al., (2016)	RSUP Prof. Dr. R. D. Kandou Manado	28.73% (25 dari 87)
Tjhie et al., (2017)	RSUP Prof. DR. R. D. Kandou Manado	36.6% (30 dari 82)
Novayanti & Loesnihari (2019)	RSUP. H.Adam Malik Medan	56.3% (120 dari 213)
Lydia et al., (2019)	3 Center (RSUPN Cipto Mangunkusumo RSUP, Persahabatan, dan RSUP Fatmawati Jakarta)	38.8% (156 dari 402)
Siregar & Wahyuni (2022)	RS Universitas Sumatera Utara	35% (7 dari 20)
Wahyudin & Basbeth (2022)	RSUI Banyubening Boyolali	3.7% (11 dari 292)
Dharmesti et al., (2022)	RSUP Sanglah Hospital Denpasar	28.2% (94 dari 338)
Nur Fajri et al., (2023)	RSU Universitas Muhammadiyah Malang	5% (8 dari 160)

Based on Table 1, the highest prevalence of Hepatitis C was reported in the study by Novayanti *et al.* (2017), with a prevalence rate of 56.3% among a total of 213 patients. In contrast, the lowest prevalence was observed in the study by Wahyudin *et al.* (2022), with a prevalence of 3.7% among 292 patients.

Table 2. Distribution of Hepatitis C Prevalence by Gender

Penulis dan Tahun	Jenis Kelamin
Widhani et al, (2015)	Lk : 21 / 27.6% Pr : 8 / 13.6%
Liana et al., (2015)	Lk : 1 (16.7%) Pr : 5 (83.3%)
Belung et al., (2016)	Lk : 13 (52%) Pr : 12 (48%)
Utsumi et al., (2016)	Lk : 45 (67.2%) Pr : 22 (32.8%)
Tjhie et al., (2017)	Lk : 18 (60%) Pr : 12 (40%)
Lydia et al., (2019)	Lk : 75 (56.4%) Pr : 58 (43.6%)
Siregar & Wahyuni (2022)	Lk : 4 / 20 % Pr : 3 / 15 %
Wahyudin & Basbeth (2022)	Lk : 8 (72.7%) Pr : 3 (27.3%)
Dharmesti et al., (2022)	Lk : 54 (57%) Pr : 40 (43%)

Based on Table 2, nine out of the eleven included studies reported that the prevalence of Hepatitis C was higher among male patients compared to female patients.

Table 3. Distribution of Hepatitis C Prevalence by Age

Penulis dan Tahun	Rentang Usia (terbanyak)
Liana et al., (2015)	35-44 dan 45-54 tahun (2 / 66.6%)
Belung et al., (2016)	40-49 dan 50-59 tahun (8 / 32%)
Tjhie et al., (2017)	39-47 tahun (10 / 33.3%)
Wahyudin & Basbeth (2022)	60-69 tahun (5 / 45.4%)

Based on Table 3, four out of the eleven studies reported the distribution of Hepatitis C prevalence according to age groups. Across these studies, the highest prevalence of Hepatitis C infection was observed among older adults, beginning at the age of 45 years and above, consistent with the World Health Organization (WHO) definition of older age groups (2013).

Discussion

It is widely recognized that hemodialysis (HD) patients are at high risk of Hepatitis C virus (HCV) infection (Abou Rached et al., 2016). Several studies conducted in various hospitals across Indonesia have reported varying prevalence rates. The highest prevalence of Hepatitis C among hemodialysis patients was reported by Novayanti *et al.* (2017) at H. Adam Malik General Hospital, Medan, involving 213 respondents, with a prevalence of 56.3%. This finding is consistent with the study by Jakupi *et al.* (2018) in Kosovo, which involved 668 respondents and reported an HCV prevalence of 53% among hemodialysis patients (Jakupi et al., 2018). Both studies reported prevalence rates exceeding 50%, although the Kosovo study included a larger sample size.

In contrast, the lowest prevalence of Hepatitis C among hemodialysis patients in Indonesia identified in this literature review was reported at RSUI Banyu Bening Boyolali, with a prevalence of 3.7%. This rate is higher than those reported in studies conducted in Central India (2016), which involved 1,253 respondents and reported a prevalence of 1.38%, and in Somalia (2021), which included 220 respondents and reported a prevalence of 3.2% among hemodialysis patients (Dubey et al., 2016; Jeele et al., 2021).

This literature review also identified five studies reporting relatively similar prevalence rates, clustering around 30%, despite differences in sample size. These studies were conducted at Universitas Sumatera Utara Hospital (35%) in 2022, Prof. Dr. R. D. Kandou General Hospital Manado (36.6%) in 2017, four private hemodialysis units in Surabaya (37.2%) in 2016, Dr. Cipto Mangunkusumo National Referral Hospital Jakarta (38%) in 2015, and a combined analysis of three hospitals in Jakarta—Dr. Cipto Mangunkusumo Hospital, Fatmawati Hospital, and Persahabatan Hospital (38.8%). These findings are comparable to a study conducted in India in 2022, which reported an HCV prevalence of 31.68% among 60 respondents (Raina et al., 2022).

Hepatitis C transmission may occur through blood transfusion and the use of dialysis equipment. According to recommendations from the Indonesian Society of Nephrology (PERNEFRI), all hemodialysis patients should undergo anti-HCV testing every six months. However, some patients do not comply with this recommendation due to financial constraints, increasing the risk of undetected transmission sources (Widhani et al., 2015). Variations in HCV prevalence across studies are likely influenced by differences in hemodialysis facility characteristics, study methodologies, and data collection periods. Large referral hospitals tend to manage patients with longer dialysis duration and more frequent transfusion histories, resulting in higher reported HCV prevalence. Differences in study design, sample size, and potential selection bias also influence prevalence estimates. Retrospective descriptive studies with small sample sizes are more prone to selection bias, whereas multicenter studies with larger samples tend to provide more stable estimates, although they remain affected by inter-unit heterogeneity. Additional contributing factors include variations in screening policies and adherence to infection control protocols across facilities.

Duration of hemodialysis is a major risk factor for hepatitis seroconversion; the longer a patient undergoes hemodialysis, the higher the risk of exposure to hepatitis B and C viruses (Raina et al., 2022). In addition to long-term repeated exposure to blood products, hemodialysis patients experience impaired immune function due to irreversible chronic kidney disease, increasing susceptibility to viral hepatitis infections (Raina et al., 2022). A cross-sectional study at Gadjah Mada Academic Hospital demonstrated an association between duration of hemodialysis and anti-HCV seroconversion, where all Hepatitis C seroconversions (27.9%) occurred in patients undergoing hemodialysis for more than 24 months, with none observed in patients receiving hemodialysis for 0–12 months or 12–24 months (Kurnia Fitriyani et al., 2025). These findings are consistent with a study by Liana *et al.* (2015) at RSMH Palembang, which reported the highest seroconversion rate among patients undergoing hemodialysis for more than 24 months (9.6%). Similarly, a study conducted at Dr. Cipto Mangunkusumo Hospital in 2015 found that patients undergoing hemodialysis for more than 42 months experienced higher HCV seroconversion rates compared to those with shorter dialysis duration (Widhani et al., 2015).

The quality of healthcare services and adherence to infection control measures vary considerably among hemodialysis facilities, particularly between large urban centers and smaller regional units. Global reports indicate that nosocomial transmission in hemodialysis units occurs when sterilization procedures are inconsistently applied, dialysis rooms are overcrowded, and staff are inadequately trained—conditions more frequently observed in low-resource or low-cost facilities (Fabrizi et al., 2021). In many developing countries, including Indonesia, universal HCV screening for all hemodialysis patients is not routinely implemented due to financial and laboratory limitations. Screening often relies solely on anti-HCV antibody testing without confirmatory testing, as HCV RNA testing and follow-up diagnostics are more costly. Consequently, early infections may remain undetected, allowing patients to continue hemodialysis without accurate identification of HCV status, thereby facilitating viral transmission within hemodialysis units. Furthermore, dialyzer reuse is more common in resource-limited settings to reduce per-patient costs. Although technical guidelines state that reuse is safe when strict sterilization standards are followed, inconsistencies in disinfection and sterilization validation frequently occur in practice, increasing the risk of cross-contamination between patients.

According to the 2008 Kidney Disease Improving Global Outcomes (KDIGO) recommendations, prevention of Hepatitis C transmission in hemodialysis units should be achieved through three main strategies: optimal implementation of standard infection control procedures, regular HCV screening accompanied by systematic documentation and monitoring of test results, and consistent application of standard operating procedures (SOPs) for clinical services and treatment. These recommendations align with policies of the Indonesian Society of Nephrology (PERNEFRI), which stipulate that nursing staff in hemodialysis units should hold dialysis certification, although full implementation has not yet been achieved. Additional preventive measures include the use of erythropoietin therapy to reduce the need for blood transfusions—one of the risk factors for HCV transmission—and recommendations to avoid dialyzer reuse.

Based on the findings of this literature review, eight of the eleven included studies reported a higher prevalence of Hepatitis C infection among male hemodialysis patients compared to females. These findings are consistent with international studies, including those conducted by Raina (2022) in India (36.36% in males vs. 25.92% in females), Motwade (2020) in Egypt (53.16% in males vs. 46.84% in females), and Osman (2021) in Somalia (57% in males vs. 43% in females) (Jeele et al., 2021; Kerollos et al., 2020; Raina et al., 2022).

Conversely, a study by Liana *et al.* (2015) at RSMH Palembang reported higher Hepatitis C seroconversion among female patients compared to males (83.3% vs. 16.7%). This finding is consistent with the study by Jakupi *et al.* (2018) in Kosovo, which reported an HCV prevalence of 42.8% in females and 36.4% in males (Jakupi et al., 2018). According to the 2018 Indonesian Basic Health Research (Riskesdas), the prevalence of chronic kidney disease (CKD) in Indonesia was 0.41% among males and 0.39% among females (Kemenkes RI, 2019). The 13th Annual Report of the Indonesian Renal Registry (2020) reported that new hemodialysis patients were

predominantly male (55%), totaling 37,640 patients. The report also indicated that the primary diagnosis leading to hemodialysis initiation was CKD stage 5 (61,786 patients), followed by acute kidney injury (4,625 patients) (Pernefri, 2020).

Literature indicates that men have a 50% higher risk of progression to end-stage renal disease (ESRD) compared to adult women (Harris and Zhang, 2020). Estrogen plays a protective role in reducing the risk of CKD in women through mechanisms such as vasodilation, inhibition of vascular remodeling, and stimulation of endothelial cell growth, contributing to sex differences in CKD prevalence (Liana et al., 2015). Population-based studies have also shown higher CKD prevalence in women but lower rates of renal replacement therapy compared to men, while disease progression from CKD to ESRD occurs more rapidly in men. These differences may be influenced by the antifibrotic and antiapoptotic effects of estrogen or the proinflammatory effects of testosterone. Women are also less frequently referred for renal replacement therapy and receive fewer arteriovenous fistulas than men, regardless of race (Bar and Markell, 2019). Lower HCV prevalence among women may also be influenced by relatively smaller sample sizes, variations in local population characteristics, and selection bias.

In this literature review, four of the eleven studies reported data on age groups with the highest prevalence of Hepatitis C infection among hemodialysis patients. The highest prevalence was observed in the 35–44 and 45–54 age groups, with rates of 66.6%, followed by other age groups above 45 years, which can be categorized as older adults according to the WHO 2013 classification. A study conducted in Somalia in 2022 reported the highest HCV prevalence in the 61–80 age group, with a prevalence of 57.1% (Jeele et al., 2021). Age is a major risk factor for CKD, as renal function decline generally begins in midlife. Findings from the Baltimore Longitudinal Study of Aging (BLSA) demonstrated that aging is naturally accompanied by a gradual decline in renal function, even in individuals without pre-existing kidney disease (Liana et al., 2015).

According to Riskesdas 2018, the highest prevalence of CKD was observed in individuals aged 65–74 years (0.82%), followed by those aged >75 years (0.75%) and 55–64 years (0.72%) (Kemenkes RI, 2019). The 2020 Indonesian Renal Registry report indicated that the largest proportion of new hemodialysis patients was in the 55–64 age group (31.19%), followed by 45–54 years (29.36%) and >65 years (16.01%). A similar age distribution was observed among active hemodialysis patients as of December 2020, with the highest proportions in the 55–64 (30.14%), 45–54 (29.69%), and >65 (14.96%) age groups (Pernefri, 2020).

In addition, HCV prevalence tends to increase with advancing age. One study reported that approximately 75% of individuals with positive anti-HCV results were older than 65 years. In older populations, HCV infection poses a greater risk due to specific characteristics such as diminished immune response, which not only increases susceptibility to complications but also limits treatment options and reduces therapeutic effectiveness (Alvarez et al., 2016). Immune function declines with age (immunosenescence), rendering older adults more susceptible to chronic infections and increasing the likelihood of progression from acute to chronic infection (US Preventive Services Task Force, 2020). Moreover, because HCV infection often remains asymptomatic in its early stages, many individuals infected at a younger age live with the virus for decades, resulting in increased detection or disease progression in older age (Reid et al., 2017).

The persistently high prevalence of Hepatitis C among hemodialysis patients indicates suboptimal implementation and uneven coverage of routine anti-HCV screening in hemodialysis units, as well as deficiencies in infection control practices. Variations in prevalence across facilities reflect differences in adherence to standard operating procedures, including sterilization practices, dialyzer reuse, and monitoring of patients' HCV status, which may have implications for hemodialysis service policies. From both clinical and public health perspectives, hemodialysis patients with HCV infection face higher mortality risks and contribute to increased potential for nosocomial transmission. These findings underscore the importance of regular anti-HCV screening every six months, improved education and competency of hemodialysis personnel, and strengthened infection control measures as strategic steps to support national Hepatitis C elimination efforts.

The reviewed studies demonstrated substantial variation in methodological quality. The primary strengths of several studies included relatively large sample sizes and multicenter

designs, which enhance population representativeness and external validity. However, most studies were single-center with small sample sizes, limiting the stability and generalizability of prevalence estimates. Diagnostic methods also varied widely, ranging from ELISA and rapid/strip tests to RT-PCR, resulting in differences in sensitivity and specificity that complicate cross-study comparisons. Furthermore, the predominance of cross-sectional designs and reliance on medical record data increased the risk of selection and information bias and limited the ability to assess temporal relationships and causal risk factors for HCV infection among hemodialysis patients.

The literature analyzed in this review has several methodological limitations. Most studies employed cross-sectional and descriptive analytic designs, precluding causal inference and incidence estimation of HCV infection. Sampling was largely based on medical records, increasing the risk of information bias and inconsistent testing intervals. Regarding diagnostic methods, only two studies used ELISA, one employed rapid/strip testing, and only one study used HCV RNA RT-PCR as the gold standard. These variations in diagnostic approaches may have contributed to differences in detection sensitivity and to the heterogeneity of reported prevalence estimates.

4. CONCLUSION

The findings of this review indicate that male sex and older age are important risk factors for Hepatitis C infection among hemodialysis patients in Indonesia. These results highlight the need for stricter nosocomial prevention measures and targeted screening strategies for high-risk groups to reduce incidence rates. From a scientific perspective, these differences in vulnerability may be explained by behavioral factors, exposure to medical procedures, and age-related immune changes. The application of these findings may inform the development of routine screening policies and patient education programs in hemodialysis units. Future research is recommended to explore additional biological and environmental risk factors and to evaluate the effectiveness of preventive interventions in reducing Hepatitis C prevalence in hemodialysis facilities.

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