

Mitigating HBV And HCV Seroconversion In Hemodialysis Patients: Infection Control Measures And Outcomes At Eskag Sanjeevani Hospital, Kolkata, India

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Abstract

Patients with end-stage renal disease (ESRD) undergoing hemodialysis (HD) are at elevated risk for acquiring blood-borne infections, particularly hepatitis B virus (HBV) and hepatitis C virus (HCV), especially in high-endemic regions like India. This study examines the infection control interventions implemented by Eskag Sanjeevani Hospital in Kolkata to reduce the seroconversion rates of these viral infections among HD patients. By adhering to CDC and KDIGO guidelines, the hospital has established stringent infection prevention protocols, including the use of personal protective equipment (PPE), isolation of infected patients, meticulous decontamination practices, and exclusive use of non-shared medical instruments. Furthermore, advanced diagnostic tools, routine screening, HBV vaccination programs, and continuous education of healthcare personnel have been central to the hospital's infection control strategy. These multifaceted measures have resulted in a marked reduction in infection rates, reflecting improved clinical outcomes and reinforcing the hospital's commitment to optimizing the quality of care for HD patients in this high-risk setting.

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I. Introduction

End-stage renal disease (ESRD) is a severe and life-threatening condition that compromises the immune system, making patients highly susceptible to infections. Hemodialysis (HD), a critical treatment for ESRD, involves accessing the bloodstream, which increases the risk of transmitting blood-borne viruses such as hepatitis B virus (HBV) and hepatitis C virus (HCV). This risk is particularly pronounced in high endemic regions like India, where the prevalence of these infections is significantly elevated.¹ Patients undergoing hemodialysis face unique challenges due to their compromised immunity. Studies have shown that these patients often experience lymphopenia and reduced counts of T4 and T8 lymphocytes, leading to diminished immune responses. The nature of the hemodialysis procedure, with potential for blood contamination and the communal setting of dialysis units, further amplifies the risk of infection transmission.² Consequently, hemodialysis patients have a notably higher risk of HCV infection compared to the general population, resulting in decreased quality of life and increased mortality. In light of these challenges, Eskag Sanjeevani Hospital in Kolkata, India, has undertaken significant measures to mitigate the risk of seroconversion among its HD patients. By implementing rigorous infection control protocols, regular screening, the use of single-use dialyzers, and continuous education for both staff and patients, the hospital aims to significantly lower infection rates and improve patient outcomes. This introduction sets the stage for an in-depth examination of the preventive strategies employed by Eskag Sanjeevani Hospital and their impact on reducing the incidence of HBV and HCV infections among hemodialysis patients.

Risks associated with seroconversion in HD patients

End-stage renal disease (ESRD) is an immune-compromised condition characterized by disturbed cell-mediated immunity, significantly affecting patients' ability to ward off infections. ESRD patients, especially those undergoing maintenance hemodialysis (HD), are particularly vulnerable to viral infections such as hepatitis B virus (HBV) and hepatitis C virus (HCV). This vulnerability is exacerbated in high endemic zones like India, where the prevalence of these blood-borne infections is notably high.¹

Hemodialysis, a life-sustaining procedure for ESRD patients, involves regular access to the bloodstream, thereby increasing the risk of transmission of various infections. Studies have shown that patients on maintenance HD exhibit lymphopenia and reduced T4 and T8 lymphocyte counts. The uremic lymphocytes in these patients demonstrate lower proliferation rates compared to healthy individuals, making them particularly susceptible to infections. The process of hemodialysis itself, with the potential for blood contamination on device surfaces and the communal nature of dialysis units, further contributes to the risk of infection.²

HCV infection is a significant concern among hemodialysis patients due to its association with decreased quality of life, increased all-cause, and cardiovascular mortality. The risk of HCV infection in dialysis patients is considerably higher compared to the general population. Multiple factors contribute to this heightened risk, including the reuse of dialyzers, type of vascular access, and specific practices within individual dialysis units. Nosocomial infections have been identified in several local HCV outbreaks within dialysis units, underlining the need for stringent infection control practices.³

Hepatitis B virus (HBV) has historically posed a significant infection risk within hemodialysis facilities. Hemodialysis patients are at increased risk for HBV infection due to frequent exposure to blood and blood products during the dialysis procedure. The reservoir of infection for potential transmission of HBV is substantial in hemodialysis patients. Following HBV infection, these patients are at a higher risk of becoming chronic carriers compared to the general population. Moreover, the seroconversion rate after HBV vaccination is lower in chronic hemodialysis patients than in the general population. This reduced vaccine efficacy is associated with an increased risk of hepatocellular carcinoma and mortality in the ESRD population. Effective infection control measures are crucial to mitigate these risks and improve the overall health outcomes for hemodialysis patients.⁴

Prevalence of Seroconversion among HD patients in India

HCV Prevalence

The prevalence of Hepatitis C Virus (HCV) infection among patients on maintenance hemodialysis (MHD) in India varies widely, with studies indicating a range from 4.3% to 45%.⁵ A previous study analyzing data over four years showed a decrease in HCV seroconversion rates among HD patients:

- 2018: 5.08%
- 2019: 2.82%
- 2020: 0.91%
- 2021: 0.81%

HBV Prevalence

For Hepatitis B Virus (HBV) infection, a study found that new HBV infection occurred in 5.5% of the HD patients, with a cumulative prevalence of 7.3%.

Coinfection of HBV and HCV

Coinfection with both HBV and HCV was found among 1.2% of HD patients.⁶

Cumulative Data Summary

To summarize the cumulative prevalence of HBV and HCV among HD patients in India:

- **HCV Prevalence Range:** 4.3% to 45%
- **Annual HCV Seroconversion Rates:**
 - 2018: 5.08%
 - 2019: 2.82%
 - 2020: 0.91%
 - 2021: 0.81%
- **HBV Prevalence (New Infections):** 5.5%
- **Cumulative HBV Prevalence:** 7.3%
- **Coinfection (HBV and HCV):** 1.2%

Remarkably low seroconversion rate among HD patients in Eskag Sanjeevani Hospital, Kolkata, India

At Eskag Sanjeevani Hospital in Kolkata, India, the seroconversion rate among HD patients is remarkably low. India being a developing country, it is expected that the seroconversion rate will be adequately high given one of the most populous and most heterogeneous continents in the world. The number of patients with end-stage renal disease is rapidly growing here.⁷ If the percentage is compared with the prevalence data of the developed country, such as USA, the ratio becomes 1:4 (4.6% in Eskag Sanjeevani and 18.6% in the USA). The data on seroconversion count among HD patients of Eskag Sanjeevani Hospital are provided below.

Sl no.	Month	Active Patient	Negative	Positive	Sero Conversion Count	Sero Conversion Percentage
1	Oct-20	3326	2864	462	8	0.28
2	Nov-20	3321	2859	462	4	0.14
3	Dec-20	3451	2971	480	24	0.81
4	Jan-21	3592	3093	499	29	0.93
5	Feb-21	3597	3097	500	25	0.81
6	Mar-21	3653	3145	508	29	0.93

7	Apr-21	3695	3181	514	18	0.58
8	May-21	3510	3022	488	25	0.81
9	Jun-21	3602	3101	501	25	0.81
10	Jul-21	3677	3166	511	15	0.46
11	Aug-21	3747	3226	521	19	0.58
12	Sep-21	3764	3241	523	11	0.35
13	Oct-21	3836	3313	523	21	0.63
14	Nov-21	3341	2800	541	26	0.93
15	Dec-21	3985	3444	541	12	0.35
16	Jan-22	4030	3497	533	31	0.89
17	Feb-22	4118	3570	548	25	0.70
18	Mar-22	4242	3689	553	26	0.70
19	Apr-22	4214	3634	580	45	1.24
20	May-22	4436	3828	608	25	0.65
21	Jun-22	4536	3905	631	41	1.05
22	Jul-22	4517	3877	640	33	0.85
23	Aug-22	4640	3971	669	48	1.21
24	Sep-22	4742	4071	671	24	0.59
25	Oct-22	4756	4085	671	36	0.88
26	Nov-22	4772	4109	663	11	0.27
27	Dec-22	4781	4116	665	25	0.61
28	Jan-23	4938	4252	686	25	0.59
29	Feb-23	5101	4392	709	21	0.48
30	Mar-23	5314	4575	739	21	0.46
31	Apr-23	5330	4589	741	17	0.37
32	May-23	5386	4637	749	28	0.60
33	Jun-23	5361	4616	745	28	0.60
34	Jul-23	5366	4620	746	28	0.60
35	Aug-23	5315	4576	739	27	0.60
36	Sep-23	5213	4488	725	27	0.60
37	Oct-23	4850	4176	674	25	0.60
38	Nov-23	4780	4116	664	25	0.60
39	Dec-23	4810	4141	669	25	0.60
40	Jan-24	3705	3190	515	19	0.60
41	Feb-24	3985	3431	554	21	0.60
42	Mar-24	4138	3563	575	21	0.60
43	Apr-24	4383	3774	609	23	0.60
44	May-24	4520	3892	628	23	0.60
45	Jun-24	4336	3733	603	22	0.60
46	Jul-24	4648	4002	646	24	0.60

Table: Seroconversion percentage among HD patients of Eskag Sanjeevani Hospital in last four years

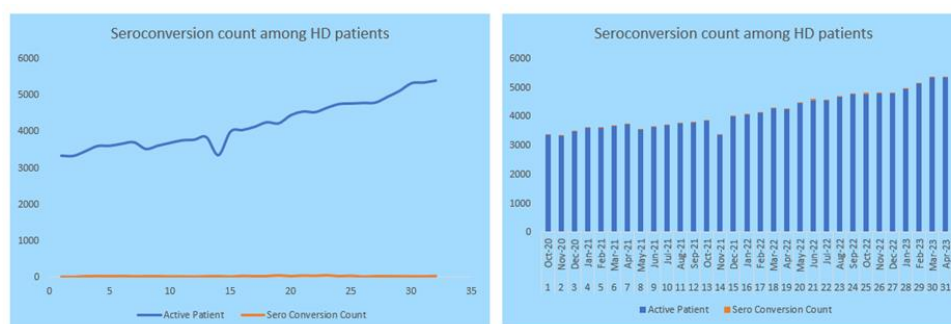


Figure: Seroconversion percentage among HD patients of Eskag Sanjeevani Hospital in last four years Preventive measures taken by Eskag Sanjeevani Hospital, Kolkata, India

At Eskag Sanjeevani Hospital in Kolkata, India, we adhere strictly to the guidelines endorsed by the Centers for Disease Control and Prevention (CDC) and Kidney Disease: Improving Global Outcomes (KDIGO) to minimize the risk of HBV and HCV seroconversion among our hemodialysis (HD) patients. Our comprehensive infection control protocol includes the following stringent measures:

Standard Precautions

Glove Protocol:

- Healthcare providers are required to wear gloves during all clinical encounters with HD patients.
- Gloves must be changed after each patient interaction to prevent cross-contamination.

Isolation of Positive Patients:

- Patients diagnosed with HBV or HCV are isolated to minimize the risk of transmission to other patients.

Protective Apparel:

- Staff must wear water-proof gowns when treating patients, changing gowns between each patient to maintain aseptic conditions.

Decontamination Procedures:

- Systematic decontamination of the equipment circuit and surfaces is performed after each patient's treatment to eliminate any potential pathogens.

Equipment Handling

Non-sharing of Instruments:

- Instruments such as tourniquets, stethoscopes, and blood pressure cuffs are not shared between patients.
- Single-use instruments are preferred wherever possible.

Avoidance of Multi-use Vials:

- The use of multi-use vials of medications, such as heparin, is strictly prohibited to prevent cross-contamination.

Blood Transfusion and EPO Therapy

Recombinant Erythropoietin (EPO) Therapy:

- EPO therapy is administered to reduce the need for blood transfusions, thereby minimizing the risk of HBV and HCV transmission.

Blood Transfusions:

- While necessary in certain cases of end-stage renal disease (ESRD), transfusions are conducted under stringent protocols to ensure the highest safety standards and reduce the risk of seroconversion.

Monitoring and Testing

Advanced Diagnostic Techniques:

- We utilize the third-generation enzyme-linked immunosorbent assay (ELISA) for the detection of anti-HCV antibodies, ensuring early and accurate identification of HCV infections.

Routine Screening:

- Regular screening of all HD patients for HBV and HCV is conducted to promptly identify and manage new infections.

Vaccination and Education

Hepatitis B Vaccination:

- All eligible patients and healthcare staff are vaccinated against Hepatitis B, significantly contributing to the decline in new HBV cases.

Staff Training and Education:

- Continuous education and training programs for healthcare workers on infection control practices and the importance of adherence to protocols.

Management of Occult HBV

Monitoring for Occult HBV:

- Patients are closely monitored for occult HBV infection, which remains a potential risk for seroconversion despite routine screening.

By implementing these comprehensive preventive measures, Eskag Sanjeevani Hospital has successfully reduced the seroconversion rates of HD patients, thereby improving their overall health outcomes and quality of life. These initiatives reflect the hospital's commitment to patient safety and its proactive approach to managing the risks associated with hemodialysis in a high endemic zone for HBV and HCV.

II. Conclusion

Eskag Sanjeevani Hospital in Kolkata has effectively implemented a comprehensive infection control protocol to minimize the risk of HBV and HCV seroconversion in hemodialysis patients. By adhering to evidence-

based guidelines and instituting rigorous preventive strategies, the hospital has significantly reduced infection rates, thereby improving patient outcomes and overall quality of care. Key measures include strict use of personal protective equipment, enforcement of isolation protocols, exclusive use of non-shared medical devices, and advanced diagnostic and surveillance methods. The hospital's proactive approach, incorporating HBV vaccination, routine serological screening, and ongoing healthcare worker education, underscores its commitment to patient safety and infection risk management in a high-endemic area. These efforts emphasize the critical role of robust infection control measures in protecting at-risk patient populations, setting a benchmark for other healthcare institutions in similar epidemiological settings.

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