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Seroprevalence and Diagnostic Utility of Rapid and ELISA Test for Detection of Hepatitis B, Hepatitis C Virus among Patients Undergoing Hemodialysis

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A B S T R A C T

HBV, HCV pose a major health problem throughout the world. Due to invasive procedure patients undergoing hemodialysis are at high risk of acquiring infections. Infections acquired in dialysis unit can prolong hospitalization thus increasing the current study intended at detecting the prevalence of HBV and HCV infection among hemodialysis patients exercising the Rapid Immunochromatographic Test (ICT) and enzyme-linked immunosorbent assay (ELISA). Conventional ELISA is regarded as the most used screening test but due to limitations like high cost, unavailability, time consuming nature and requirement of skilled personnel for interpretation of result, rapid tests are gaining more importance and warrants comparison of performance. All test samples ranged in age group (15-76) years. Test results revealed (39.3%) positive for HBV and (59.0%) positive for HCV in rapid ICT. ELISA further verified tested samples for confirmed results. This study showed that there is high prevalence of HBV and HCV infection among patients undergoing hemodialysis. Hence, stern adherence to infection prevention and control measures, isolation of seropositive patients, ample screening of HBV and HCV for donated blood and donors is indispensable to minimize the risk of HBV and HCV infections.

Introduction

Hepatitis is inflammation of the liver due to viral infection and leads to significant morbidity and mortality (Kumar *et al.,* 2010). The HBV and HCV infection are highly infectious and transmitted from person to person by blood transfusions, sexual and vertical routes (Iwasa *et al.,* 2008).

There are many ways by which the HBV, HCV infection can be transmitted, as the infection is blood borne so the direct contact with contaminated blood represents the principal cause of propagation. This may occur due to blood transfusion, needle stick injuries or more likely via injection drug use IUD (Doerrbecker *et al.,* 2013).

HBV, HCV infections are the most common viral infections among individuals with renal disease (Sit *et al.,* 2007). End stage renal disease patients are at higher risk of acquiring HBV and HCV infections than the general population due to deficient immune response, exposure to blood transfusion and HD equipment (Edey *et al.,* 2010). Nosocomial and iatrogenic transmission, duration of ESRD, duration of dialysis and mode of

dialysis are other risk factors in HD patients (Muller *et al.,* 1992; Pereira *et al.,* 1997).

Studies from India have reported variable prevalence and incidence. Initial studies reported very high anti HCV positivity rates in HD patients, accounting for nearly 24-28% positivity (Arankalle *et al.,* 1995; Gosavi *et al.,* 1997). The incidence of HBV infection in dialysis population has declined over the recent decades, essentially because of enhancements in infection control and widespread implementation of HBV vaccination.

The study was conducted in a tertiary care hospital to detect Hepatitis B surface antigen and HCV antibody in HD patients.

Materials and Methods

This study was conducted between Dec 2022 to May 2023 at Dialysis Unit of Superspeciality hospital Jammu. This is the only dialysis unit having 40 beds and providing HD to about 80-100 patients on average every day. All the patients visiting dialysis unit during the said period were included in the current study. No patients were excluded from this study except who were not ready to participate. 5ml of blood sample was collected and allowed to stand for sufficient time for separation of serum.

The sample was then centrifuged and serum was separated. The serum sample was tested for HBV and HCV by ELISA Reader (Thermo Scientific Multiskan EX, Thermo Fisher Scientific Oy, Vantaa, Finland.) using reagent for HBsAg and Anti HCV (Merilisa HCV and Merilisa HBsAg by Meril Diagnostics).

Results and Discussion

Out of 61 HD patients, HBsAg was detected in 24 patients and HCV was detected in 36 patients. Among admitted HBV and HCV infected HD patients, males patients were more (32) than female (29) [TABLE 1]. Also mean age of female patient was 46.31 $\pm$ 14.271 and that of male patient was 48.53$\pm$ 10.641.

The prevalence of viral hepatitis is grander in patients on HD than general people affecting quality of life and mortality. In present study, the result depicted the prevalence of HBV and HCV infection was 39.3% and 59% respectively in patients on hemodialysis. HBV infection is less prevalent than HCV in HD units (Oesterreicher and Muller, 1995).

Prevalence rates vary in diverse geographical areas. In most of the studies, HBV infection among hemodialysis patients was between 4 and 11% and HCV infection was between 8 and 12%. The prevalence of HCV antibodies in patients from nephrology units is high and has been reported to range from 5 to 54% (Wright and Pereira, 1997). The prevalence of HBV infection within dialysis units in developing countries appears higher (2-20%) based on several reports (Fabrizi *et al.,* 2008).

In India, HBV and HCV in reported study among HD patients is variable. Reddy *et al.,* (2005) have reported that among hemodialysis patients 5.9% were HCV positive while 1.4% had HBV infection (Reddy *et al.,* 2005). Chandra *et al.,* (2004) have reported that among the patients of CKD, renal transplant or hemodialysis, HBV, HCV were 7%, 46% (Chandra *et al.,* 2004).

Table.1 Age and Gender Distribution of HD Patients

		N	Range	Minimum	Maximum	Mean	Std. Deviation
Age in years		61	61	15	76	47.48	12.441
Valid N (listwise)		61					
Gender (f=1;m-2)		N	Range	Minimum	Maximum	Mean	Std. Deviation
Female	age in years	29	57	15	72	46.31	14.271
Male	age in years	32	51	25	76	48.53	10.641

Out of 61 patients, HBV was present in 24 (39.3%) patients [TABLE 2]. Twenty were positive at the time of admission and the rest were first time detected post admission.

Table.2 Gender (f=1;m-2) * hep B Rapid Cross tabulation

			hep B Rapid		Total
			negative	positive	
Gender(f=1;m-2)	Female	Count	20	9	29
		% within gender(f=1;m-2)	69.0%	31.0%	100.0%
	Male	Count	17	15	32
		% within gender(f=1;m-2)	53.1%	46.9%	100.0%
Total		Count	37	24	61
		% within gender(f=1;m-2)	60.7%	39.3%	100.0%

Table.3 Gender (f=1;m-2) * hep B ELISA Cross tabulation

			hep B ELISA		Total
			negative	positive	
Gender(f=1;m-2)	Female	Count	20	9	29
		% within gender(f=1;m-2)	69.0%	31.0%	100.0%
	Male	Count	17	15	32
		% within gender(f=1;m-2)	53.1%	46.9%	100.0%
Total		Count	37	24	61
		% within gender(f=1;m-2)	60.7%	39.3%	100.0%

Out of 61 subjects, anti HCV antibody was positive in 36(59.0%) [TABLE 3]. Liver enzymes were within normal limit in the subjects of interest.

Table.4 Gender (f=1;m-2) * hep C Rapid Cross tabulation

			hep C Rapid		Total
			negative	positive	
Gender(f=1;m-2)	Female	Count	9	20	29
		% within gender(f=1;m-2)	31.0%	69.0%	100.0%
		% of Total			
	Male	Count	16	16	32
		% within gender(f=1;m-2)	50.0%	50.0%	100.0%
		% of Total			
Total		Count	25	36	61
		% within gender(f=1;m-2)	41.0%	59.0%	100.0%
		% of Total			

Table.5 Gender (f=1;m-2) * hep C ELISA Cross tabulation

			hep C ELISA		Total
			Negative	Positive	
Gender(f=1;m-2)	Female	Count	9	20	29
		% within gender(f=1;m-2)	31.0%	69.0%	100.0%
	Male	Count	16	16	32
		% within gender(f=1;m-2)	50.0%	50.0%	100.0%
Total		Count	25	36	61
		% within gender(f=1;m-2)	41.0%	59.0%	100.0%

It has been reported that HD surges the chances of blood borne viral infection but the prevalence varies from hemodialysis unit-to-unit, region-to-region and country-to-country. Hence, screening of blood for HBV and HCV before transfusion should be done by PCR or by testing nucleic acids (Kuhns and Busch, 2006). Duration of HD is also a risk factor for acquiring the infection. Longer the duration more is the chances of getting the infection by HBV and HCV. CKD patients who undergo repeated HD are at greater risk of developing infection by HBV and HCV. Such patients need to be screened for early detection of these infections. In order to decrease the transmission segregation of infected and other patients need to be done at the time of admission and later on. Vaccination for hepatitis B and treatment for HCV infection persons will also help in prevention of infection.

Author Contributions

Shalu Mengi: Investigation, formal analysis, writing—original draft. Aishiya Isharat: Validation, methodology, writing—reviewing. Sandeep Dogra:—Formal analysis, writing—review and editing.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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