

Original Research Article

Prevalence of hepatitis B and hepatitis C in patients of chronic kidney disease

Rishabh Sehgal¹, Harsimranjit Singh², Inderpal Singh^{3*}, Jyotisterna Mittal⁴, Payal Gupta³, Kanwerpreet Kaur³

¹Department of Gastroenterology, DMC and H, Ludhiana, Punjab, India

²Department of Cardiology, Shri Jayadeva Institute of Cardiology, Bangalore, Karnataka, India

³Department of Medicine, Government Medical College, Patiala, Punjab, India

⁴Consultant Dermatologist Ludhiana, Punjab, India

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*Correspondence:

Dr. Inderpal Singh,

E-mail: drinderpal@gmail.com

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ABSTRACT

Background: Patients of CKD are highly exposed to HBV and HCV because of multiple blood transfusions and exposure to contaminated equipments. Infections by HBV and HCV are significant cause of morbidity in CKD patients by causing liver damage and membranoproliferative GN. Present study was done to observe the prevalence of HBV and HCV in patients of CKD and to compare the prevalence of these infections in patients who were on maintenance haemodialysis and who were not on maintenance hemodialysis.

Methods: This study had been conducted on 140 patients. Patients were diagnosed as having CKD on basis of Cockcroft-gault equation as per KDOQI guidelines. Stage 3, 4 or 5 patients were included for the study whereas patients with stage 1 or 2 were excluded. These 140 cases were divided into 2 groups, Group I included 70 cases who were on maintenance hemodialysis and Group II included 70 patients who were not on maintenance hemodialysis. The prevalence of HBV and HCV in the two groups was observed. Diagnosis of HBV was made by detection of HBsAg (one step immunoassay) and diagnosis of HCV was made by detection of antibodies to Hepatitis C (enzyme linked immunoassay). Prevalence data of NCDC was used for comparison with general population.

Results: In Group I, 15 (21%) patients were positive for HCV and 9 (12.9%) were positive for HBV which is significantly higher compared to Group II patients in which 6 (8.6%) and 2 (2.9%) were positive respectively. Overall out of 140 patients, 21 (15%) were positive for HCV and 11 (7.9%) were positive for HBV, which is significantly higher compared to data of NCDC for general population in which prevalence of HCV and HBV is 1% and 4% respectively

Conclusions: Prevalence of HBV and HCV was significantly higher in patients of CKD than the general population, which was further higher in patients who were on maintenance hemodialysis and have received multiple blood transfusions, emphasizing the need to implement the methods to limit the spread of HBV and HCV.

Keywords: Chronic Kidney Disease, Hemodialysis, Hepatitis B Virus, Hepatitis C Virus, Prevalence.

INTRODUCTION

Chronic kidney disease (CKD) is becoming a major health problem.¹ It encompasses different pathophysiological processes associated with abnormal kidney

function and leads to various complications involving virtually every system of the body. These patients are managed conservatively but eventually they require Hemodialysis (HD), peritoneal dialysis and/or transplantation. These patients are highly exposed to

infections like hepatitis b (HBV) and hepatitis c (HCV) because of high number of blood transfusions, prolonged vascular access and the potential for exposure to infected patients and contaminated equipment. Infection with these viruses is a significant cause of morbidity and mortality in these patients by causing liver injury and by being an etiologic factor in secondary glomerular diseases like focal segmental glomerulosclerosis (FSGS) and membranoproliferative glomerulonephritis (MPGN). So, the present study was conducted to determine the prevalence of Hepatitis B and Hepatitis C in patients of chronic kidney disease and to find any difference in prevalence between patients those who are on maintenance hemodialysis vis-a-vis those who are not on maintenance hemodialysis. This study would help in implementing the preventive methods to limit the spread of HBV and HCV infections in CKD patients

METHODS

The present study was carried out from January 2015 to December 2015 in 140 cases diagnosed as CKD, admitted in Medical wards/Nephrology department of Guru Nanak Dev Hospital and allied group of hospitals attached to Government Medical College, Amritsar, after obtaining their informed consent. A detailed history of the patient was taken along with investigations like Blood urea, Serum creatinine, Urine complete, Ultrasound abdomen, HBsAg and Anti HCV antibodies. Author used Cockcroft-Gault equation 2 to calculate Glomerular Filtration Rate (GFR) and to make the diagnosis of CKD as per K/DOQI guidelines (only stage 3,4,5 was taken). Two groups were made. 70 patients who had GFR of less than 15 ml/min/1.73m2 and were on regular hemodialysis were taken in the first group and 70 patients who had GFR between 15-59 ml/min/1.73m2 and were on conservative management were taken in the second group.

Table 1: Kidney Disease Outcomes Quality Initiative (K/DOQI) Guidelines classified CKD into five stages 3.

Stage	Description	GFR (ml/min/1.73m2)
1.	Slight kidney damage with normal or increased filtration	More than 90
2.	Mild decrease in kidney function	60-89
3.	Moderate decrease in kidney function	30-59
4.	Severe decrease in kidney function	15-29
5.	Kidney failure	Less than 15 (or dialysis)

Cockcroft-Gault equation 2:
 Estimated Creatinine-clearance(male) = $(140 - \text{Age}) \times \text{Body Weight (Kg)} / 72 \times \text{Serum Creatinine (mg/dl)}$

(Multiply by 0.85 in female)

Inclusion criteria

Diagnosed patients of chronic kidney disease as per K/DOQI guidelines who were in stage 3,4 or 5.

Exclusion criteria

Diagnosed patients of chronic kidney disease as per K/DOQ1 guidelines who were in stage 1 and stage 2.

Method and Principle for detection of HBsAg and antibodies to Hepatitis C:

Detection of HBsAg- this was done by a one step immunoassay based on antigen capture or sandwich principle. The method used monoclonal antibodies conjugated to colloidal gold and polyclonal antibodies immobilized on a nitrocellulose strip in a thin line. The test sample was introduced to and flows laterally through an absorbent pad where it mixes with the signal reagent. If the sample contained HBsAg, the colloidal gold antibody conjugate binds to the antigen forming an antigen-antibody-colloidal gold complex. The complex then migrated through the nitrocellulose strip by capillary action. When the complex meets the line of immobilized antibody, the complex was trapped forming an antibody-antigen-antibody colloidal gold complex.

Detection of antibodies to Hepatitis C- for this, HCV antigens were immobilized on a porous immunofiltration membrane. Sample and the reagents passed through the membrane and were absorbed into the underlying absorbent pad. As the patient's sample passed through the membrane, HCV antibodies if present in serum/plasma, bind to the immobilized antigens. In the next step, the protein-A conjugate was added which binds to HCV antibodies to give distinct colour.

Statistical analysis

Data was described in terms of mean±standard deviation (±SD) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups was done using t- test. For comparing categorical data , Chi square test was performed. A probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS (Statistical Package for the Social Science) SPSS 21.

RESULTS

The present study was carried out to determine the prevalence of Hepatitis B and Hepatitis C in patients of chronic kidney disease. Two groups were made. 70 patients who had GFR of less than 15 ml/min/1.73m2 and were on regular hemodialysis were taken in the first group (Group I) and 70 patients who had GFR between

15-59 ml/min/1.73m² and were on conservative management were taken in the second group(Group II).

The mean age of Group I was 51.2±12.713 years and of Group II was 52.72±15.88 years and the difference were statistically insignificant. Out of 70 patients who were on maintenance hemodialysis(Group I), 38 (54.3%) were males and 32 (45.7%) were females. However, in the Group II those who were on conservative management, 36 (51.4%) were males and 34 (48.6%) were females.

Prevalence of associated risk factors in patients of CKD.

Hypertension was present in 74.2% (52/70) patients who were on hemodialysis and in 68.5% (48/70) patients who were not on hemodialysis, whereas Diabetes Mellitus was equally prevalent in both the groups i.e. 42.8% (30/70). 14.2% (10) patients on hemodialysis and 17.1% (12) patients not on hemodialysis have other risk factors like chronic glomerulonephritis, chronic interstitial nephritis, polycystic kidney disease, drug abuse etc. See Table 2.

Table 2: Prevalence of associated risk factors in patients of CKD.

Risk Factors	Group I (Patients on Hemodialysis)		Group I (Not on Hemodialysis)		Total	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
Hypertension	30	42.8	28	40	58	41.4
Diabetes Mellitus	8	11.4	10	14.2	18	12.8
Both	22	31.4	20	28.5	42	30
Others*	10	14.2	12	17.1	22	15.7
Total number of hypertensive patients	52	74.2	48	68.5	100	71.4
Total number of diabetic patients	30	42.8	30	42.8	60	42.8

HBsAg seropositivity in CKD patients

In this study it was observed that out of 70 patients on hemodialysis, 9 patients (12.9%) were HBsAg positive whereas only 2 (2.9%) patients on conservative management were positive for HBsAg. Data was statistically analysed and it was observed that the patients on maintenance hemodialysis had significantly higher prevalence of HBV than patients not on maintenance hemodialysis (p value <0.05). See Table 3 and Figure 1.

HCV seropositivity in CKD patients

Out of 70 patients on hemodialysis, 15 patients (21%) were anti HCV positive. On the other hand, only 8.6% of patients on conservative management were anti HCV positive. Similarly, data was statistically analysed and it showed the difference to be statistically significant (p value <0.05). See Table 4 and Figure 2.

Table 3: HBsAg seropositivity in CKD patients.

CKD Patients	No. of patients	HBsAg Positive	HBsAg Negative	% of Positive Patients
Pt on HD	70	9	61	12.9
Pt not on HD	70	2	68	2.9
Total	140	11	129	7.9

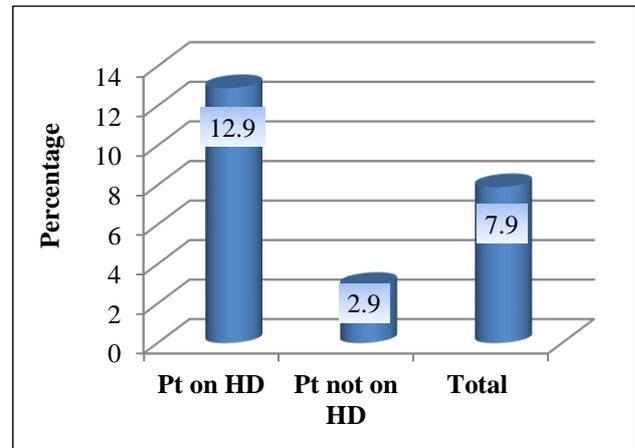


Figure 1: percentage of HBSAG positive CKD patients.

Table 4: HCV seropositivity in CKD patients.

CKD Patient	No of patient	Anti HCV antibody positive	Anti HCV antibody negative	% of positive patients
Patient on HD	70	15	55	21
Not on HD	70	6	64	8.6
Total	140	21	119	15

Prevalence of hepatitis B and C in CKD patients

In this study, prevalence of Hepatitis B was 15% and Hepatitis C was 7.9% in CKD patients as shown in Figure 3.

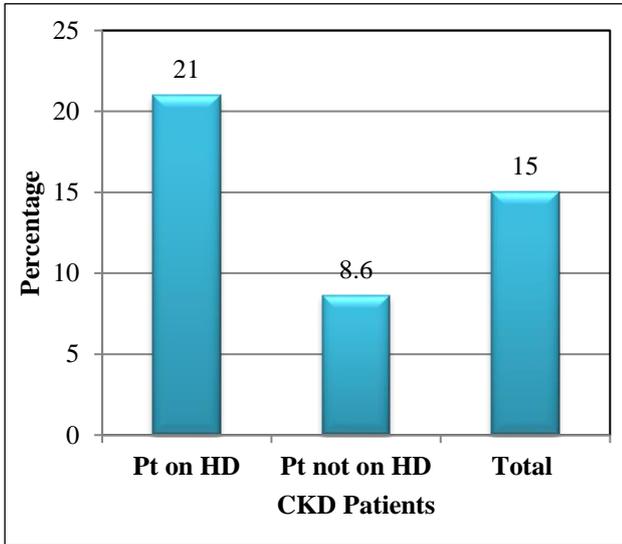


Figure 2: percentage of HCV positive CKD patients.

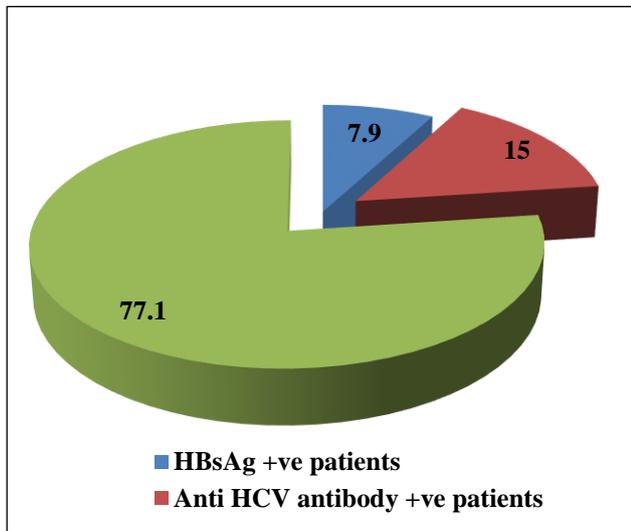


Figure 3: prevalence of hepatitis B and C in CKD patients.

Effect of duration of dialysis in CKD patients and HBV and HCV prevalence in them

Out of 70 patients on dialysis, 26 patients had undergone hemodialysis for more than 2 years, and out of them, 7 patients (26.9%) were HBsAg positive and 10 (38.4%) were anti HCV positive. On the other hand, 44 patients had undergone hemodialysis for less than or equal to 2 years, and out of them, only 2 patients (4.5%) were HBsAg positive and 5 patients (11.3%) were anti HCV positive.

It was observed that the patients with more than 2 years of dialysis have significantly higher prevalence of HBV and HCV than that of patients who have undergone dialysis for less than or equal to 2 years (p value <0.05). See Table 5.

Table 5: Duration of dialysis in CKD patients and HBV, HCV prevalence in them.

Duration of dialysis	No of patient	HBsAg positive	ANTI HCV POSITIVE
≤ 2 years	44	2 (4.5%)	5 (11.3%)
>2 years	26	7(26.9%)	10 (38.4%)

No. of blood transfusions in CKD patients and HBV and HCV prevalence.

It was observed that out of 70 patients on hemodialysis, 40 patients received less than or equal to 5 blood transfusions and out of them only 2 (5%) were HBsAg positive and 4 (10%) were anti HCV positive, whereas 30 patients received more than 5 blood transfusions and out of them 7 (23.3%) were HBsAg positive and 11(36.6%) were statistically significant (p value <0.05, <0.05) showing that patients with more than 5 blood transfusions have more prevalence of HBV and HCV than patients having less than or equal to 5 blood transfusions.

Out of the 70 patients who were not on hemodialysis, 65 patients received less than or equal to 5 blood transfusions and only 1 patient (1.5%) was HBsAg positive and 4 (6.1%) patients were anti HCV positive. Only 5 patients received more than 5 blood transfusions in this group and out of them, 1 (20%) was HBsAg positive and 4 (6.1%) patients were anti HCV positive. The difference between these 2 subgroups was also statistically significant (p value <0.05, <0.05). See (Table 6).

Table 6: No. of blood transfusions in CKD patients and HBV, HCV prevalence.

CKD Patients	No. of Blood Transfusions	No. of patient	HBsAg Positive	Anti HCV positive
Patient on HD	0-5	40	2(5%)	4
	>5	30	7(23%)	11
Not on HD	0-5	65	1(1.5%)	4
	>5	5	1(20%)	2

DISCUSSION

Development of CKD increases patient mortality and morbidity and puts a major strain on the health care system. The use of hemodialysis has led to the increased longevity of these patients, but it also predisposes them to some infections, especially blood born viruses like Hepatitis B and C, which represent a significant cause of morbidity and mortality.

In this study the overall prevalence of HBV infection in CKD patients was 7.9%. This is higher than the estimated average prevalence rates of 3-5% of HBV in the general population in India.⁴ In this study the prevalence of HBV in CKD patients not on maintenance hemodialysis was 2.9% which is quite similar to the results of study by Loapez-Alcorocho et al, which showed prevalence of 2.8% in CKD patients on predialysis.⁵

In case of HCV, condition is more severe due to non-availability of vaccine and higher window period of virus for the screening in blood. In this study, the overall prevalence of HCV in CKD patients was 15% as compared to the prevalence of HBV which was 7.9%.

The prevalence of HCV infections among hemodialysis patients in this study was 21%. This is similar to the prevalence rate of HCV in hemodialysis patients in India, which ranges from 4.3-46%. In a study from Delhi, the reported prevalence was 27.7%.⁶ Various studies from Hyderabad reported the prevalence as 13.3%, 42% and 46%.⁷⁻⁸ However, the estimated prevalence of HCV infection in patients on maintenance hemodialysis is less in developed countries; which is 7.8% in the USA, 5.2% in Germany, and 10% in Japan.⁹⁻¹¹

In this study HCV prevalence was significantly higher in patients on maintenance hemodialysis than those who are on conservative management (p value <0.05). These results were similar to those by Kumar H et al. They found that out of a total 116 patients of CKD in the hemodialysed group, 46% patients were anti HCV positive while in the non-dialysed group, only 6% were anti HCV positive.¹² On the contrary, in a study conducted by LoApez-Alcorocho et al, no statistical significant difference was found between the two groups.⁵

Author further divided the Group I (those who are on maintenance hemodialysis) into two groups ; one who were on maintenance hemodialysis for more than 2 years and another who were on maintenance hemodialysis for less than or equal to 2 years. After statistically analysing the data author found significant difference (p value <0.05) in prevalence of HBV and HCV between them, showing that patients who are on longer duration of hemodialysis have greater risk of HBV and HCV infections.¹³⁻¹⁴

Patient's age and the number of transfused blood products are the 2 factors most consistently associated with increased prevalence of HBV and HCV infection in dialysis patients, irrespective of geographic location.¹⁶ In this study the prevalence of HBV and HCV was significantly higher in patients those who received more than 5 blood transfusions than those who received less than 5 blood transfusions. Chanpong et al, and Hinrichson et al, noted that higher rate of seropositivity is found in patients with multiple transfusions.¹⁶⁻¹⁷

As these viral infections have common modes of transmission, presence of co-infection in patients is not rare and is relatively high in transfusion recipients. The prevalence of dual infection of HCV and HBV ranges from 3-3.7% in India.¹⁸ However, in this study, none of the total 140 patients of both the groups showed coinfection with HBV and HCV. These results are comparable with those of Vedat et al, from Turkey as they were also unable to detect HBV in hemodialysis undergoing HCV infected patients.¹⁹ The absence of dual infection in this study could be due to the small number of patients included in this study.

Diabetes is the most common causative risk factor for CKD in India and abroad. In this study, there were 42.8% diabetics (HbA1c levels >6.5 or on regular medication). This observation is slightly higher than the data from the CKD registry of India which reveals that diabetic nephropathy accounts for 31.2% of CKD in India. Modi et al, found diabetic nephropathy as the commonest cause of CKD and in their study the prevalence was 44% which is similar to this finding (42.8%).²¹ Thus, it is evident that CKD patients on maintenance hemodialysis are more prone to have blood borne infections with Hepatitis B and C viruses as compared to the patients not on hemodialysis.

Also, duration of dialysis, number of blood transfusion are positive risk factors for transmission of Hepatitis B and C even today thus; underlining the need to strictly follow universal precautions.

CONCLUSION

CKD patients are at a greater risk and have a higher prevalence of HBV and HCV than general population. Moreover, prevalence of HBV and HCV is higher in patients who are on maintenance hemodialysis and have undergone more number of dialysis and blood transfusions. Findings call for more focus on hepatitis prevention in CKD patients by immunization with HBV vaccine and strict adherence to universal precautions; to help decrease prevalence of both infections among these high risk patients.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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