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Immunization practice in patients with chronic kidney disease on haemodialysis

Nagati Sharanya Reddy*
Under Graduate Student, Vydehi Institute of Medical Science and Research Centre, Whitefield, Bengaluru, Karnataka, India.
*Corresponding author

Meenakshi Kalyan
Professor, Department of Medicine, Vydehi Institute of Medical Science and Research Centre, Whitefield, Bengaluru, Karnataka, India.

Raghunandhan
Assistant Professor, Department of Medicine, Vydehi Institute of Medical Science and Research centre, Whitefield, Bengaluru, Karnataka, India.

Mohith Reddy K
Post Graduate student, Department of Medicine, Vydehi Institute of Medical Science and Research Centre, Whitefield, Bengaluru, Karnataka, India.

Mohammed Ishaq
Post Graduate student, Department of Medicine, Vydehi Institute of Medical Science and Research Centre, Whitefield, Bengaluru, Karnataka, India.

Raghavendra Reddy Nagate
Assistant Professor, Department of Periodontics and Community Dental Sciences, College of Dentistry, King Khalid University, Abha, Kingdom of Saudi Arabia

Shreyas Tikare
Assistant Professor, Department of Periodontics and Community Dental Sciences, College of Dentistry, King Khalid University, Abha, Kingdom of Saudi Arabia

Shivakumar G C
Professor, Department of Oral Medicine & Radiology, People's College of Dental Sciences and Research Centre, People's University, Bhopal, MP, India

***Abstract*---**Background: Immunization is an important component of maintaining health and wellness in patients with chronic kidney disease. The aim of the study is to describe the awareness about the vaccination in patients with chronic kidney disease on haemodialysis and to estimate the vaccination status received in these patients on

dialysis. Methods: It is a cross sectional study conducted in 83 patients diagnosed to have chronic kidney disease undergoing dialysis for at least 1 month. Demographic characteristics and comorbidity data (as self-reported) were collected and questionnaire assessment was filled about the vaccination and counselling received. Results: The prevalence of CKD were 73.5% in males and 26.5% in females with a mean age of 48.9 years. Among the different occupations of the patient with no job/housewife was 56.6% while professional jobs were 18.1% business and non-professional source were 13.3% and agriculture related was 12.0%. Evaluation of education stated that patients educated with higher schooling had 15.6% of prevalence of CKD compared to degree holders and Masters. The different comorbidities among the studied patients were Hypertension- 84.3%, Diabetes- 47%, Stroke- 12%, Connective tissue disorder- 18.1% and COPD- 44.6%. 53 % of patients were undergoing dialysis between 1-5 years and 12% patients were on dialysis for more than 5 years. Among the 83 CKD patients, 85.5% patients had awareness about hepatitis B vaccine, 33.7% about pneumococcal vaccine, 7.2% about MMR vaccine, 10.8% about influenza vaccine, 1.2% about varicella vaccine and 13.4% about hepatitis A vaccine. 93% of patients had no awareness for MMR vaccine and were not vaccinated, and 90 % of patients had no awareness for Influenza vaccine and were not vaccinated. 60.2% of total subjects received counselling about vaccines, remaining 39.8 % did not receive counselling. Conclusion: Counselling regarding the vaccination is very important and also maintaining their vaccination card prevents various diseases and decreases mortality.

***Keywords*---**Awareness, Chronic kidney disease, Haemodialysis, Immunization, Vaccination.

Introduction

Infections are the most common cause of hospitalization and mortality in patients with chronic kidney disease (CKD) particularly undergoing haemodialysis and immunization is an important component of maintaining health and wellness. The dysfunctional immune system with impaired innate and adaptive immunity is responsible for an increased susceptibility to infection. Uremic toxins, oxidative stress, endothelial dysfunction, low grade inflammation, mineral and bone disorders contribute to the impaired immune system in these patients.[1] Centre for Disease control and prevention (CDC) guidelines for vaccination (Table 1) in chronic kidney disease summarized in the Recommendations of the Advisory committee on Immunization practice (ACIP) recommends guidelines which is in line with The Kidney Disease : Improving Global Outcomes (KDIGO) guidelines for vaccination and is supported by clinical evidence that have shown significant reduction in hospitalization rates and risk of mortality among CKD patients who received vaccination.[2]

Currently, given the lack of large randomized trials, it is important to understand the role ofvaccinations in the preventive care of this patient population and need to be familiar with thedata for commonly used adult vaccines.

Objective

The primary objective is to enhance the awareness of population about the vaccination in patients with chronic kidney disease on haemodialysis, the counselling received by the individuals and to estimate the vaccination status received in these patients on dialysis.

Materials and Methods

This is a descriptive, cross-sectional study conducted in 83 patients of age 18 years and above, diagnosed to have chronic kidneydisease undergoing dialysis for at least 1 month in Vydehi Institute of Medical Science and Research Centre, Bengaluru were included in the study after obtaining ethical committee approval and informed consent. Demographic characteristics and comorbidity data as self-reported including Diabetes, Hypertension, Stroke, Coronary artery disease, chronic obstructive pulmonary disease, connective tissue diseases, duration of diagnosed chronic kidney disease undergoing dialysis were collected from a direct interview and documents. Patients were asked to fill a questionnaire to assess their awareness about the vaccination, counselling received and vaccinations received.

Exclusion criteria: Patients with current bacterial or viral infections, sepsis, tuberculosis, acute renal injury, chronic liver disease, malignancies, or a history of hepatitis B or C infections were excluded from the study.

Results

The descriptive analysis for our study takes into account various variables that are listed below in Table 1.

Table 1: Guidelines for vaccination

Vaccine	Dose	Vaccine schedule	Booster dose
Hepatitis B	40 mcg	0, 1, 2, 6 months intramuscular	Yes, anti HBs < 10 U/L
Pneumococcal 13	15 µg	PCV 13 1st dose, 8 weeks later PPSV23	1 dose after 5 years
MMR	0.5 ml	1 single dose subcutaneously	No
Hepatitis A	1440 U	0, 6, 12 months intramuscular	No
Influenza	0.5 ml	1 dose every year intradermal	
Varicella	0.5 ml	0, 1, month subcutaneously	No

In table 2, the terms 'AV' refer to 'Awareness about vaccine' and 'VR' implies 'Vaccine received'. The prevalence of CKD were73.5% in males and 26.5% in females with a mean age of 48.9 years.

Table 2: Represents awareness and types of vaccine received

Time of diagnosis of CKD	<1year	16	19.3	19.3	19.3
	1-5 years	46	55.4	55.4	74.7
	>5years)	21	25.3	25.3	100.0
	Total	83	100.0	100.0	
Duration of dialysis	<1year	29	34.9	34.9	34.9
	1-5 years	44	53.0	53.0	88.0
	>5years)	10	12.0	12.0	100.0
	Total	83	100.0	100.0	
Hepatitis B AV	Yes	71	85.5	85.5	85.5
	No	12	14.5	14.5	100.0
	Total	83	100.0	100.0	
Pneumococcal AV	Yes	28	33.7	33.7	33.7
	No	55	66.3	66.3	100.0
	Total	83	100.0	100.0	
MMR AV	Yes	6	7.2	7.2	7.2
	No	77	92.8	92.8	100.0
	Total	83	100.0	100.0	
Influenza AV	Yes	9	10.8	10.8	10.8
	No	74	89.2	89.2	100.0
	Total	83	100.0	100.0	
Varicella AV	Yes	1	1.2	1.2	1.2
	No	82	98.8	98.8	100.0
	Total	83	100.0	100.0	
Hepatitis A AV	Yes	11	13.3	13.4	13.4
	No	71	85.5	86.6	100.0
	Total	82	98.8	100.0	
	Missing	1	1.2		
	Total	83	100.0		
Counselling received	Yes	50	60.2	60.2	60.2
	No	33	39.8	39.8	100.0
	Total	83	100.0	100.0	
Hepatitis B VR	Yes	68	81.9	81.9	81.9
	No	15	18.1	18.1	100.0
	Total	83	100.0	100.0	

Pneumococcal VR	Yes	4	4.8	4.8	4.8
	No	79	95.2	95.2	100.0
	Total	83	100.0	100.0	
MMR VR	Yes	1	1.2	1.2	1.2
	No	82	98.8	98.8	100.0
	Total	83	100.0	100.0	
Influenza VR	Yes	1	1.2	1.2	1.2
	No	82	98.8	98.8	100.0
	Total	83	100.0	100.0	
Varicella VR	No	83	100.0	100.0	100.0
Hepatitis A VR	Yes	2	2.4	2.4	2.4
	No	81	97.6	97.6	100.0
	Total	83	100.0	100.0	
Anti-HBs titres	Yes	26	31.3	31.3	31.3
	No	57	68.7	68.7	100.0
	Total	83	100.0	100.0	
Vaccination Card	Yes	41	49.4	50.0	50.0
	No	41	49.4	50.0	100.0
	Total	82	98.8	100.0	
	Missing	1	1.2		
	Total	83	100.0		
Hypertension	Yes	70	84.3	85.4	85.4
	No	12	14.5	14.6	100.0
	Total	82	98.8	100.0	
	Missing	1	1.2		
	Total	83	100.0		
Diabetes	Yes	39	47.0	47.0	47.0
	No	44	53.0	53.0	100.0
	Total	83	100.0	100.0	
Stroke	Yes	10	12.0	12.0	12.0
	No	73	88.0	88.0	100.0
	Total	83	100.0	100.0	
Connective tissue diseases	Yes	15	18.1	18.1	18.1
	No	68	81.9	81.9	100.0
	Total	83	100.0	100.0	
COPD	Yes	37	44.6	44.6	44.6
	No	46	55.4	55.4	100.0
	Total	83	100.0	100.0	
History of blood transfusion	Yes	67	80.7	80.7	80.7
	No	16	19.3	19.3	100.0

	Total	83	100.0	100.0	
History of hospitalisation	Yes	38	45.8	45.8	45.8
	No	45	54.2	54.2	100.0
	Total	83	100.0	100.0	
Route of dialysis	IJV	37	44.6	44.6	44.6
	FV	5	6.0	6.0	50.6

Among the different occupations of the patient with no job/housewife was 56.6% while professional jobs were 18.1% business and non-professional source were 13.3% and agriculture related was 12.0%. Evaluation of education stated that patients educated with higher schooling had 15.6% of prevalence of CKD compared to degree holders and Masters. (Table 3).

Table 3: Demographic characteristics of patients

Variable analysed	Variable characteristic	Frequency	Percentage (%)	Valid percentage (%)	Cumulative frequency
Gender	Male	61	73.5	73.5	73.5
	Female	22	26.5	26.5	100.0
	Total	83	100.0	100.0	
Occupation	Agriculture and related	10	12.0	12.0	12.0
	Business and non-professional	11	13.3	13.3	25.3
	Professional jobs	15	18.1	18.1	43.4
	No job/housewife	47	56.6	56.6	100.0
Educational status	10th- 12th standard	42	50.6	50.6	50.6
	Graduation Degree	17	20.5	20.5	71.1
	Masters	8	9.6	9.6	80.7
	No education	16	19.3	19.3	100.0
	Total	83	100.0	100.0	
Location	Karnataka	42	50.6	50.6	50.6
	Non-Karnataka	41	49.4	49.4	100.0
	Total	83	100.0	100.0	
	No	15	18.1	18.1	100.0
	Total	83	100.0	100.0	

The different comorbidities among the studied patients noted were Hypertension- 84.3%, Diabetes- 47%, Stroke- 12%, Connective tissue disorder- 18.1% and COPD- 44.6%. (Figure 1). 19.3% of patients were diagnosed to have CKD for less

than 1 year (Figure 2). 53 % of patients were undergoing dialysis between 1-5 years and 12% patients were on dialysis for more than 5 years. (Figure 3).

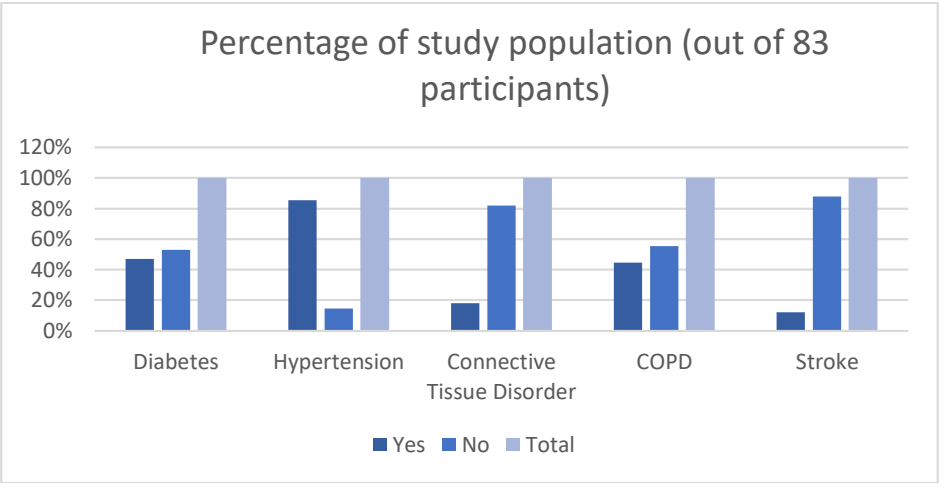

Figure 1: Comorbidities of study participants

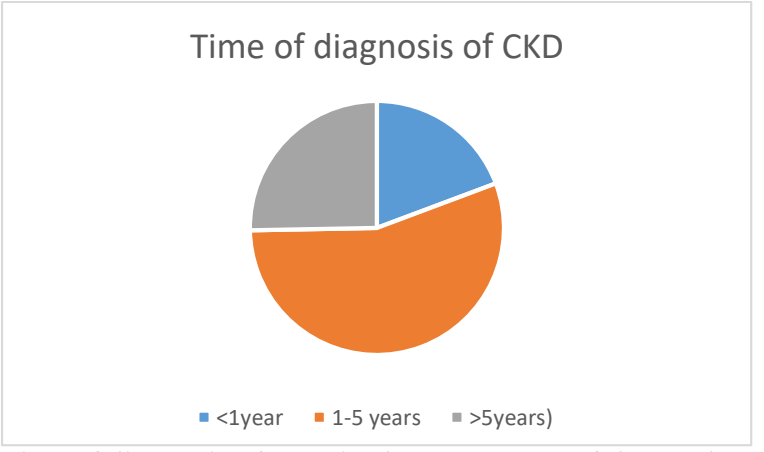

Figure 2: Time of diagnosis of CKD in the percentage of the study population

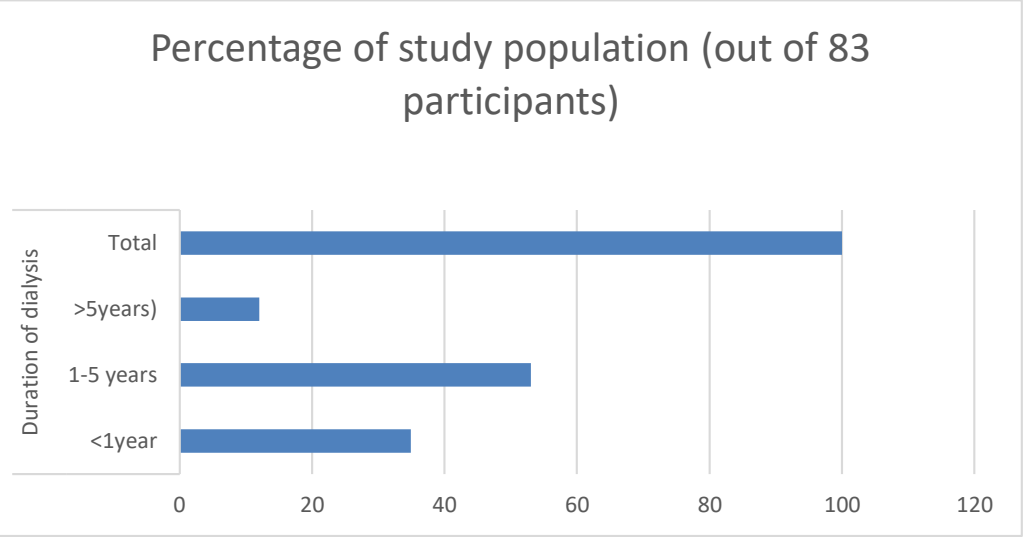

Figure 3: Time period of CKD patients on dialysis

Among the 83 CKD patients, 85.5% patients had awareness about hepatitis B vaccine, 33.7% about pneumococcal vaccine, 7.2% about MMR vaccine, 10.8% about influenza vaccine, 1.2% about varicella vaccine and 13.4% about hepatitis A vaccine (Figure 4). Patients received different vaccination are shown in Figure 5. While 60.2% of total subjects received counselling about vaccines, remaining 39.8 did not receive counselling (Figure 6).

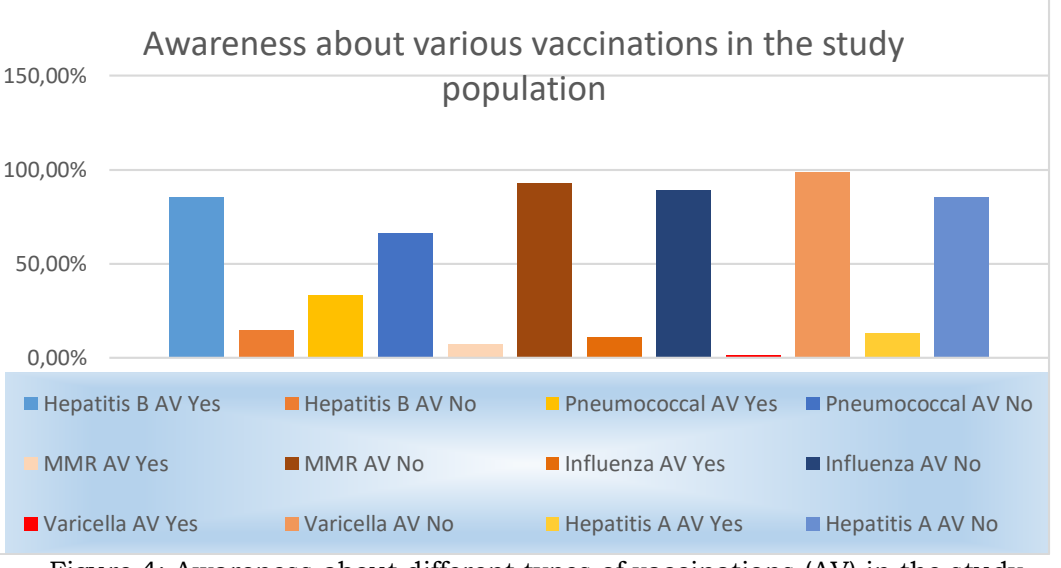

Figure 4: Awareness about different types of vaccinations (AV) in the study population represented graphically in terms of percentages

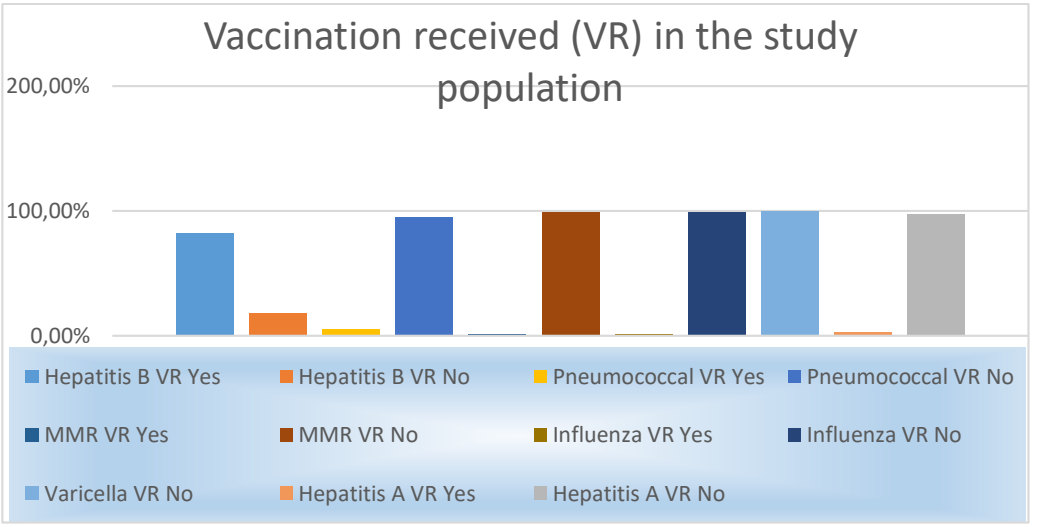

Figure 5: Vaccination received (VR) status in the study population represented graphically in terms of percentages

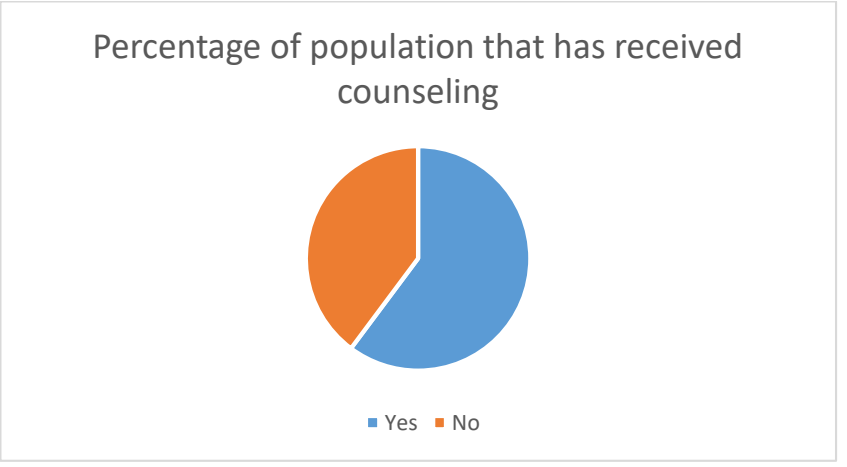

Figure 6: Percentage of population received counselling

Discussion

Chronic kidney disease (CKD) arises when there is evidence of kidney damage lasting for at least 3 months, as defined by structural or functional abnormalities of the kidney with or without a decreased glomerular filtration rate (GFR), as demonstrated either by pathologic abnormalities or by markers of kidney damage, including urine or blood abnormalities or abnormalities noted on imaging and GFR is less than 60 ml/min/1.73 m^2 for at least 3 months with or without kidney damage. CKD is categorized into 5 stages by the level of the GFR and the presence or absence of proteinuria. Stage 1 includes patients with no decrease in GFR but with kidney abnormalities. Stage 2 includes patients with mild CKD with an estimated GFR (eGFR) of 60 to 89 ml/min/1.73 m^2 and kidney abnormalities.

Stage 3 includes patients with an eGFR of 30 to 59 ml/min/1.73 m^2, and Stage 4 patients have an eGFR of 15 to 29 ml/min/1.73 m^2. Stage 5 is kidney failure; this includes patients with an eGFR of less than 15 ml/min/1.73 m^2. The prevalence of CKD in India is 17.2% with 6% have CKD stage 3 or worse. [3]. Several issues contribute to high prevalence of CKD in India which includes large numbers of patients below the poverty line, low gross domestic product, and low monetary allocations for health care have led to suboptimal outcomes. Infections are the second most common causes of morbidity and mortality in patients with CKD, contributing to 30-36% of deaths among patients with dialysis. Infections also increases the risk for cardiovascular events and leads to catastrophic healthcare expenditure secondary to invasive diseases and hospitalisations. Uremic toxins, nutritional deficiencies and immunosuppressive medications contribute to immune dysregulation. [4]. CKD affects both major immune systems: innate and adaptive responses. [5]. Regardless of the primary cause for the development of CKD, patient outcomes after the development of infections were 3-4 times worse than in non-CKD patients. The annual percentage of mortality secondary to sepsis is 100-300-fold higher in dialysis patients. This study is used to determine the awareness of various vaccinations among common infectious diseases in CKD patients. CKD is known to be commonly associated diseases with hypertension, diabetes and cardiovascular disease. In our study the prevalence of hypertension was 85.4%, followed by Diabetes mellitus, Stroke, Connective tissue disorder, COPD, while in a similar study by Wen Chin Lee et al [6] done in CKD patients showed prevalence of hypertension of 66.4%, Diabetes of 33.2%, connective tissue disorder of 0.8% and stroke of 6.2%.Hepatitis B Virus (HBV) is still a serious public health problem and there are an estimated 257 million people suffering from HBV infection around the world. [7] The prevalence and incidence of hepatitis B infections are high which is about 7.6% and 3.2 % among CKD patients in India. [8]. Vaccine provides effective protection against the infection. Antibody titre falls with time in patients on dialysis necessitating annual monitoring. Studies have shown that 33% of patients had poor knowledge of hepatitis B vaccine. [9]. Post vaccination testing for hepatitis B titres among CKD patients should be done 1-2 months after the last dose of hepatitis B series. If adequate anti hepatitis B (10mIU/mL) is present, then booster dose is not needed, if less titres then booster dose is advised. In the above study awareness of anti-hepatitis B titres was 31.3% while 68.7% of patients were unaware. Pneumococcal disease is caused by streptococcus pneumonia colonises in the upper respiratory tract causing tissue inflammation which can be prevented by pneumococcal vaccine. [10]. Infectious mortality is 21.3/1000 patients' years, caused by sepsis and pulmonary infections in respectively 75 and 20%. [11] The burden of pneumococcal infection in CKD patients is higher and the cost of the vaccine is comparatively lower. Seasonal influenza is a worldwide health problem causing morbidity and mortality in CKD. In a study conducted by Eder et al [12] showed that 43.9% of patients for influenza vaccine declared their willingness to be vaccinated in the winter season and the reasons for not planning vaccination were fear of graft injury (33.3%), complications after vaccination (32.4%) and vaccine inefficiency (15.0%). Varicella (chickenpox) is a primary infectious disease that is caused by varicella-zoster virus (VZV), an alpha herpes virus belonging to the Herpesviridae family. The secondary household attack rate of over 90% showed that varicella is highly contagious [13]. Transmissions are mostly airborne and by direct contact with vesicular fluids. Preventing varicella infection in

patients is critical, and has been proven safe and reasonably efficacious in chronic kidney disease patients. [14]. In our study the awareness of other vaccines such as MMR – 7.2%. Hepatitis A 13.4 % is not universally recommended but can beoffered for CKD and ESRD patients who travel or live in endemic areas. The vaccine is given in two doses intramuscularly 0 and 6-12 months. Our cross-sectional has revealed some startling facts. For example, nearly 93% of our study group had no awareness about the MMR vaccine and, resultantly, nearly no one (100%) had been vaccinated by the same. Another fact worth noticing was that awareness about Influenza vaccine was absent in about 90% of people and again, the vaccine wasn't received by anyone in our study population.

By analysing the overall variables employed in our study, such as the demographics, mean age of the individuals studied (about 48.9 years), their occupational status, and the vaccinations that they had received up until this point in time where they presented themselves in our hospital, one deduction can be clearly surmised- the awareness about immunisation in our country is not up to the mark, as a result of which a large population suffers from easily preventable/opportunistic infections which further increase their burden of additional health costs. Hence counselling is very important to be done as CKD patients are susceptible to various infections with high mortality and morbidity. Health care workers spread awareness and importance of vaccines among them there by reducing the incidence of infectious diseases in these patients. Also, vaccination card is of utmost importance, as this helps to keep a track of the patients of the vaccines.

There are a few limitations to our study which includes smaller sample size. The standard deviation of the population serves as a measure of variability; the standard deviation of a sample indicates how far the survey's actual results may deviate from the sample's results. The larger the standard deviation, the less reliable one's conclusions may be because smaller sample sizes become less representative of the total population, and thus extrapolating the results of our study on a much larger scale, say to that of a country might not be a good idea. Hence, we think that more research studies like these, done on a larger scale, would be beneficial in supporting the hypothesis that we analysed through our study.

Conclusion

The greatest method for reducing the negative effects of infections in CKD patients is overall prevention by vaccination. Patients with CKD have little understanding of several vaccinations. Lack of awareness is influenced by a number of variables, including sex, age, education level, place of residence, and most crucially, counselling. In order to avoid numerous diseases and reduce mortality, vaccine counselling is crucial, as is maintaining one's vaccination card.

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