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Awareness on Vaccinations among Chronic Kidney Disease Patients in Rural India

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ABSTRACT

Chronic Kidney Disease" also known as a chronic renal failure, is one of the major health problems today. The main function of the kidney in the human body is to filter the waste products of the human body and excrete the same in the form of urine. Infectious diseases are the second leading cause of morbidity and mortality in patients with chronic kidney disease, contributing around 30–36% of deaths among patients on dialysis. Overall, this condition is a threat to the life of the patients, hence to improve in the patient's condition dialysis and renal replacement therapy is a must. But before the onset of dialysis and renal replacement therapy, here, early vaccination becomes must as a primary treatment modalities to prevent patients from nosocomial infections i.e. hospital-acquired infection like Hepatitis-B, Influenza, Pneumococcal diseases, these are the common diseases due to such infection and their prevalence rate is high in India as compared to others diseases. Therefore, to prevent the patients from any such risk early vaccination is needed. This review aimed to access this information for educating the patients regarding the importance of vaccination before the onset of dialysis and renal transplantation, to suggest that this vaccine should be available at various private and government hospitals at low prices than its original price and to evaluate the effectiveness of the awareness program on vaccinations among chronic kidney disease patients. Here the problem is that many patients belonging to lower socioeconomic status can not afford this costly vaccine and many patients are not aware of this vaccination needed in chronic kidney disease before starting of dialysis, because of lack of education or no any such information received from health care professionals. Hence it's essential to create awareness regarding vaccination among chronic kidney disease patients to reduce morbidity and mortality.

Key Words: Chronic kidney disease, Hospital-acquired infection, Hepatitis B, Influenza, Pneumococcal, Patient, Vaccination

INTRODUCTION

Infection is the second major common cause of morbidity and mortality among patients with chronic kidney disease in India, contributing up to 30–36% of deaths among patients on dialysis, these patients are very susceptible to any kind of infection, which results in patient's low immunity power and patients came in immune deficiency stage. Such patients show manifestations like abnormal phagocytosis, T and B lymphocytes, they mostly suffer from septicemia and pulmonary infectious diseases. In chronic kidney disease, most of the patients died because of an infection, the mortality is high in chronic kidney disease population due to Hepatitis-B, pulmonary infection and influenza as compared to the general population.¹⁻³

Immunization is a must against common infectious disease like Hepatitis-B, pneumococcal diseases and influenza. Influenza spreads every year, but in different strength and hence every year vaccination is needed in chronic kidney disease patients and also should be taken by healthy individuals for avoiding further risk. Chronic kidney disease patients having low antibody response to vaccine indicate the degree of renal failure.^{4,5}

So, this highlights that these vaccines are must be needed for chronic kidney disease population as compared to other medical intervention. Vaccination in chronic kidney disease population saves more lives, hence the practice of vaccination for chronic kidney disease patients in hospital is necessary. Infections increase hospital stay among chronic kidney disease patients. Nephrologists, health care professionals are

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taking the initial step to participate in awareness programs and create awareness among chronic kidney disease population regarding vaccination by using educational methods and media. All these steps are very essential for the good prognosis of patients with chronic kidney disease.^{5,6}

PREVALENCE AND INCIDENCE OF CONTAGIOUS DISEASE IN CHRONIC KIDNEY DISEASE

Chronic kidney disease

In patients taking treatment for chronic kidney disease it was found that near about 35% of infection is related to hospitalizations. The occurrences of the hepatitis B infections are very high in dialysis patients, at about 7.6% and 3.2%, respectively in India.^{7,8} Mortality of patients with chronic kidney disease is higher due to Pneumonia, it is 14 to 16-fold higher than the general population. It has a global incidence of 1.5–14 per 1000 person-years, pneumonia-related treatment. Pneumonia related treatment focuses on the heavy monetary burden to healthcare.^{5–8} Mostly age group of 46–60 years got affected by Influenza disease, especially males got more affected with 50.6%. The signs and symptoms suggested that fever with cough (89.6%) followed by shortness of breath (72.7%) are the most common symptom. Most of the cases are reported in post-monsoon season, so it can be considered as peak period.^{7,8} Patients with chronic kidney disease admitted in the hospital are having more chances of hospital-acquired infection i.e nosocomial infection as compared to the general population. Because they had undergone different investigation procedures during dialysis and renal replacement therapy. There is no particular data available which will disseminate that chronic kidney disease is a stage-specific infection.^{5,7,8} While treating patients who receive maintenance dialysis, we found that infection is a primary issue behind this.

MODE OF TRANSMISSION

Hepatitis

Patients undergoing treatment for chronic kidney disease got hospitalized many times during dialysis and renal replacement therapy which forced them to undergo different procedures like blood investigation, exposure of blood products, blood transfusion, unhygienic practices during handling of hemodialysis patients, reuse of dialyser and dialysate, cross-contamination from environmental surfaces, in that condition Hepatitis-B infection can be transmitted by infected blood in chronic kidney disease patients are shown in Figure 1, which increases chances of infection and disease, therefore to prevent patients from contagious disease early vac-

cination is needed.^{9–11}

Influenza

Patients under dialysis, who shows influenza signs are at high risk for complications, which includes hospitalization and death. Patients should receive influenza vaccine usually in the winter. The mode of transmission of influenza primarily is by Person to person contact, coughing and sneezing, surface contaminated by respiratory secretions, talking and breathing can disperse the flu virus are shown in Figure 2. Symptoms of flu can be identified as headache and body aches, high fever, sore throat, fatigue also a runny nose. A flu infection is very serious for people having a low immune system.^{11, 12}

Pneumococcal Disease

Pneumococcal diseases are secondary common infection in the final stage of kidney disease population after infection of the bloodstream and it is related to increased mortality. The pneumococcal disease spreads by droplets i.e sneezing, coughing. Its infection in the lungs can cause pneumonia i.e inflammation of lungs. It enters in the bloodstream and can cause blood infection i.e septicemia and leading to poor blood flow because of which organ gets damaged, this is shown in Figure 3. The incubation period of pneumococcal pneumonia is short of 1–3 days.¹²

EPIDEMIOLOGY

Chronic kidney disease

Very few studies are available on the prevalence of infections in chronic kidney disease population. There are no particular data available which will disseminate that chronic kidney disease is stage-specific infection. But the hospitalized patients are having more chances of hospital-acquired infection as compared to other patients because they undergo different investigation procedures during dialysis and renal replacement therapy.^{13–15}

Renal disease at End stage

Acute infection is a common cause of hospitalization most of the time among the patients with end-stage renal disease and due to this infection hospital stay increases for patients.^{14, 15}

NEED FOR AN AWARENESS PROGRAM

Sometimes patients have no medium available to access the information, sometimes patients receive 2 or 3 Hepatitis B doses but he does not complete the course. On clinical observation, it was found that many patients complete Hepatitis-B vaccination course but have not completed the doses of

pneumonia and influenza vaccine because of its high cost. Complete vaccine dose charges are not affordable to many patients and even many of them don't know exactly where they should receive the vaccine. By the time due to all these reasons patients on dialysis prone to get the infection and it gets converted into complications like liver carcinoma, liver failure, septicemia, pneumonia etc. Our motive is to avoid all these things, patients should get proper information and quality life.¹⁶

FINANCIAL BURDEN OF VACCINATION

The average cost of complete doses of patients with chronic kidney disease vaccination is too high, and as most of the patients visiting hospital belong to lower socio-economical status, that's why they can not afford all the doses of vaccine and as a result vaccine dose cycle does not gets completed. In such cases, there are high chances of patients getting infected and due to infection morbidity and mortality will again increase among the chronic kidney disease patients.^{13,17} Average cost of full doses of recommendations for all vaccinations in adult patients suffering from chronic kidney disease is mentioned in Table 1.

Need for Vaccination amongst health care employees and caregivers

Hepatitis-B vaccines are necessary for health care personnel because they always come in contact with these patients and if chronic kidney disease patients will be positive for the infectious disease so it will easily transmit to health care employees also, so before coming in contact with a patient with chronic kidney disease with contagious disease vaccination amongst health care professionals is must. Other vaccines i.e Varicella, influenza etc are needed in most of the centres and it results in decreased nosocomial i.e infection occurred at the hospital. All these inactivated or killed vaccines are most important and are safer for health care employees and family members in close contact with renal transplantation patients.¹⁸⁻²⁰

Preventive strategies

The prevention strategies are always better instead of curing the disease. Vaccination status, maintenance of ideal vaccination status is needed in chronic kidney disease. Always ideally vaccinate the patients before going to transplantation and before dialysis. Though they did not receive vaccination they can also receive afterwards. Vaccines which are inactivated are generally safe after kidney transplantation.^{14,15} Live vaccines can not be administered after transplantation. Hence it is proper to implement the vaccines which are living at least 1 month before transplantation, these vaccines are easily available and the cost of the vaccine is also low. There are various types of live and killed vaccines which are

available for chronic kidney disease patients before dialysis and transplantation, which are important for 3 diseases viz. Hepatitis-B, Pneumococcal diseases and influenza. In all these three diseases, the prevalence rate is very high in India and mortality is also increasing.¹⁶⁻²⁰ Health workers, closed family members and other closed contact persons of patients are very important to be fully immunized. Make sure that everyone should take the influenza vaccine every year.²¹⁻²³

RECOMMENDATION OF VACCINATION

Numerous vaccines are available on chronic kidney disease/ renal replacement therapy patients, but most popular vaccines which are in practice in India are-

Hepatitis-B Vaccine

The patients should receive four doses of hepatitis B vaccine as early as possible in the course of the disease. Doses schedule should be 0, 1, 2, and 6 months. Hepatitis-B vaccine should be given 2 ml (40 IU) Intramuscular in deltoid muscles.²²⁻²⁴ There is no adverse effect found Hepatitis-B vaccine guidelines are shown in Table 2.

Influenza Vaccine

0.5 ML (Intramuscular) in detailed muscle stat dose once in a year.²¹⁻²⁴

Pneumococcal vaccine

The guidelines for the administration of pneumococcal conjugate vaccine-13 (PCV 13) and pneumococcal polysaccharide vaccine 23 (PPSV 23) in patients with chronic kidney disease are mentioned in Table 3. Vaccine administered in deltoid muscle stat is 0.5 ml (Intramuscular). No adverse effect was found.^{23,24}

Measles, mumps and rubella vaccine

These are live vaccine and these vaccines are preferred after renal transplant. Very necessary in all patients of prospective paediatric.^{8,23,24}

Varicella vaccine

Varicella is a live attenuated vaccine and it is contraindicated after renal replacement therapy. It is recommended all considered paediatric patients and also adolescent transplant Patients.^{19,20}

Polio vaccine

Polio vaccine given through mouth is a live vaccine and in the paediatric child. It is contraindicated in transplant recipients and their nearer contact persons. Therefore, Beneficiaries of pediatric transplants along with their family members are not included in regular polio vaccination programs.²⁴

Diphtheria, pertussis and tetanus vaccine

Killed vaccine i.e inactivate vaccines such as Diphtheria, pertussis, and tetanus are recommended to all renal transplant recipients who are considered paediatric. A booster dose of Diphtheria- tetanus only is recommended to Adult recipient.²⁴ But out of all vaccines most important vaccination is needed in chronic kidney disease for an adult is Hepatitis-B, influenza vaccine and Pneumococcal vaccine because these three diseases prevalence rate is high in India as compared to other diseases.⁸ Here it is very important to note that, above all vaccines should be taken by patients on non-dialysis day and in the non-arteriovenous fistula arm.

Travel vaccination

If you are travelling overseas then vaccination is most essential particularly when the area where few infections are endemic, they need special consideration. Before travelling pre-planning is essential which includes a blood test for searching antibodies in a particular person's blood before starting the journey.^{20, 25, 26}

BENEFITS OF PROPHYLACTIC VACCINATION AND PRIMARY PREVENTION Vaccinations have indicated a better survival rate of dialysis patients.^{8,9,20}

1. Vaccination which will help to reduce morbidity and mortality in patients with chronic kidney disease.^{8, 9, 20}
2. It helps to reduce recurrent Hospitalization.²⁴
3. Positive results can be seen after vaccination in chronic kidney disease patients for renal transplantation and dialysis.
4. Vaccination helps to protect from Infections.^{14,15}
5. Knowledge of vaccination is essential to treat chronic kidney disease patients effectively.⁶
6. Prognosis of the disease will be good.

Prognosis

Vaccination showed positive effects in chronic kidney disease patients and renal replacement therapy patients too before 1st dialysis. Ideally, early vaccination can help in preventing many infections causing morbidity and mortality without any side effects.^{20, 27, 28}

PERSPECTIVE

Vaccination is an important part of preventive treatment modalities for chronic kidney disease patients. Ideally, it should be received by chronic kidney disease patients before the onset of hemodialysis.^{8,20,23} Even though patients have not received it before the onset of dialysis, they can receive it afterwards but it necessary to complete the vaccination schedule as recommended by the Indian Journal of nephrology.⁸ If patients are immunized early risk of infection will reduce inpatients and patients response will be good for dialysis and ultimately it will result in a reduction in morbidity and mortality of a chronic kidney disease

patients.^{20,23} After renal transplantation influenza vaccination is a must for these patients for preventing them from epidemic or pandemic diseases. For example in today's COVID -19 pandemic, a patient with chronic kidney disease, if not immunized with influenza then patients may have chances of pulmonary problems like pneumonia, septicemia and hence to prevent them from all such critical issues patients should receive all vaccines.

CONCLUSION

Proper Vaccination status will decrease infection issue and economical disease burden among chronic kidney disease patients. Vaccination helps to prevent Hepatitis-B viral infection to other family members also. Above all vaccines are recommended in the chronic kidney disease population. Therefore better practice by nephrologists and awareness of vaccination in chronic kidney disease at an early stage will reduce morbidity and mortality. So it is very important to educate people in general and to increase awareness on the importance of the preventive measures related to vaccination in chronic kidney disease patients before going to dialysis and renal replacement therapy.⁶ This literacy will help to develop awareness among the general population including peoples in low socioeconomic status. Therefore every institution, nephrologists, health care providers have a responsibility to make a proper policy regarding vaccination in chronic kidney disease, practice it and create awareness as primary and preventive care to prevent morbidity and mortality among chronic kidney disease population at large.⁶

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Figure 1: Mode of transmission of Hepatitis –B patient with chronic kidney disease.⁹

Figure 2: Mode of transmission of Influenza virus a patient with chronic kidney disease.^{1,9}

Pneumococcal disease is spread by droplets i.e sneezing, coughing.

Colonize in the respiratory tract

Bacterial infection in the lungs can cause pneumonia i.e inflammation of lungs.

Pneumococcal bacteria enter in the bloodstream can cause blood infection i.e septicemia

Leading poor blood flow and organ will damage

Figure 3: Mode of transmission of Pneumonia a patient with chronic kidney disease.^{1,11}

Table 1: Average cost of commonly recommended doses of complete vaccination in adult patients suffering from chronic kidney disease.^{13,17}

Sr. No	Vaccine	Average cost	The average cost of the vaccine for total doses
1	Hepatitis-B	Rs. 60-100	Rs. 400
2	Influenza	Rs. 800-900	Rs. 900
3	Pneumococcal Vaccine PCV-13 (Pneumococcal conjugate vaccine-13) PPSV- 23 (Valent pneumococcal polysaccharide vaccine 23)	Rs. 1400-1750	Rs. 3500
			Rs. 4,800

Table 2: Recommendations for all vaccines in chronic kidney disease patients.^{8,9,12}

Vaccine	Age	Dose	Vaccination schedule/ route of administration	Booster doses
Hepatitis B	≥20 years	40 mcg	0, 1, 2, and 6 months/IM	Yes, when anti-HBs <10 UI/l
	<20 years	10 mcg	0, 1, and 6 months/IM	Yes, when anti-HBs <10 UI/l
Pneumococcal	Refer Table :3			
Influenza	3-8 years	15 µg	Each year/IM	No
	9-12 years	15 µg	Each year/IM	No
	>12 years	15 µg	Each year/IM	No
Varicella	1-12 years	0.5ml	One single dose/SC	No
Hepatitis A	>17 years	1440 U	0, 6-12 months/IM	No
Measles, mumps and rubella	>18 years	0.5 ml	One single dose/SC	No
Inactivated poliovirus	<18 years	0.5 ml	Three doses with an interval of 1-2 months	No (revaccination 1 year after the third dose)
Diphtheria and tetanus toxoids	7 years	0.5 ml	Three doses/IM	No

IM: Intramuscular, SC: Subcutaneous

Table 3: Recommendation for administering PCV13 and PPSV23 vaccines for patients with chronic kidney disease.^{23,24}

Infants and children (ages 0-18)				
Vaccine history	Recommended regimen			
Never vaccinated with PCV7 or PCV13 up to Age	Routine vaccination for PCV13 (4 dose series)	Administer 1 dose of PPSV23 at age ≥2 years and ≥8 weeks after last indicated dose of PCV13	Administer 1 dose of PPSV23 after 5 years	
Completed all recommended doses of PCV7	Administer 1 dose of PCV13 ≥8 weeks later	Administer 1 dose of PPSV23 at age ≥2 years and ≥8 weeks after last indicated dose of PCV13	Administer 1 dose of PPSV23 after 5 years	
Children aged 24-71 months who received <3 doses of PCV7 before age 24 months	Administer 2 doses of PCV13 now	Administer 1 dose of PPSV23 ≥8 weeks later after last indicated dose of PCV13	Administer 1 dose of PPSV23 after 5 years	
Children aged 24-71 months who received any incomplete schedule of 3 doses of PCV7 before age 24 months	Administer 1 dose of PCV13 now	Administer 1 dose of PPSV23 ≥8 weeks later	Administer 1 dose of PPSV23 5 year after	
Completed all recommended doses of PCV13	Administer 1 dose of PPSV23 at age ≥2 years and ≥8 weeks after last indicated dose of PCV13	Administer 1 dose of PPSV23 after 5 years	-	
Children aged 6-18 years who have not received PCV13	Administer 1 dose of PCV13 now	-	-	
Age 19-64 year				
Never vaccinated with PCV13 or PPSV23	Administer 1 dose of PCV13 now	Administer 1 dose of PPSV23 ≥8 weeks later	Administer 1 dose of PPSV23 ≥5 years later	

Table 3: (Continued)

Infants and children (ages 0-18)			
Vaccine history	Recommended regimen		
Previously vaccinated with 1 dose PPSV ₂₃ ≥1 year ago; never vaccinated with PCV ₁₃	Administer 1 dose of PCV ₁₃ now	Administer 1 dose of PPSV ₂₃ ≥8 weeks after PCV ₁₃ , which must be ≥5 years after first dose of PPSV ₂₃	-
Previously vaccinated with 2 doses of PPSV ₂₃ (last dose was ≥1 year ago); never vaccinated with PCV ₁₃	Administer 1 dose of PCV ₁₃ now	-	-
Previously vaccinated with ≥1 dose PCV ₁₃ (≥8 weeks ago); never vaccinated with PPSV ₂₃	Administer 1 dose of PCV ₁₃ now	Administer 1 dose of PPSV ₂₃ ≥5 years later	-
Previously vaccinated with ≥1 dose PCV ₁₃ (≥8 weeks ago) and 1 dose PPSV ₂₃	Administer 1 dose of PPSV ₂₃ ≥5 years after first PPSV ₂₃ dose	-	-
Age 65 year and over			
Never vaccinated with PCV ₁₃	Administer 1 dose of PCV ₁₃ now	Administer 1 dose of PPSV ₂₃ ≥8 weeks after PCV ₁₃ , which must be ≥5 years after last dose of PPSV ₂₃	
Previously vaccinated with ≥1 dose PCV ₁₃ (≥8 weeks ago)	Administer 1 dose of PPSV ₂₃ now	-	