International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Physiotherapy in Renal Transplant Patients: A Literature Review

Neha Kashyap[1], Nidhi Kalra[2]

[1]Assistant Professor, Banarsidas Chandiwala Institute of Physiotherapy, New Delhi, India
E. Mail: *neha[at]bcip.ac.in*

[2]Officiating in Charge, Banarsidas Chandiwala Institute of Physiotherapy, New Delhi, India
E. Mail: *director[at]bcip.ac.in*

Renal transplantation is the choice of treatment for end-stage renal disease. In India, there are 3.25 renal transplantations done per million population from live and deceased donors. The number of people with hypertension (HTN) is expected to double from year 2000 to 2025, thus, making India the reservoir of chronic kidney diseases (CKD) out of which many will require renal transplantation. Data suggests that about 1, 50, 000 people in India are waiting for renal transplantation. But, it has also been seen in many researches that cardiovascular morbidity and mortality remains high even after renal transplantation surgery. In some studies it has been noted that rehabilitation in CKD patients reduce the risk of mortality and morbidity. So, if physiotherapy can improve mortality and morbidity in CKD cases, we expect it to show improvement in Post renal transplant cases too. Therefore, we thought of studying the effects of physiotherapy in post renal transplant cases and to see if regular physiotherapy affects mortality and morbidity. The objective of this study would be to review the literature available on post renal transplant physiotherapy care in different countries and check its effect on mortality and morbidity.

Kidney transplantation is considered as the treatment of choice for people with ESRD, because it increases quality of life, patient has better chances of survival and lower treatment costs compared to long term dialysis. A successful transplant offers freedom from restrictions of long term dialysis and helps achieve near normal lifestyle. As transplantation is increasingly successful, largely due to improvements in drug therapy, the number of renal transplant recipients is growing and it is clear that transplant patients will soon become the largest group of renal replacement therapy patients (RRT). Globallychronic kidney disease (CKD) is emerging to be an important chronic disorder [1]. It could be due to rapidly increasing worldwide incidence of diabetes [2] and hypertension [3, 4]. CKD is defined as a slowly progressive and irreversible loss of kidney function, leading to destruction of the nephrons, which reduces the ability of the body to sustain metabolic and hydro-electrolytic renal equilibrium. Kidney dysfunction is considered to occur when the glomerular filtration rate (GFR) falls below 60 ml/min/1.73 m2, for more than 3 months, and it is said to be end stage renal disease when the GFR falls below 15 ml/min/1.73 m2. [5-7].

The overall magnitude and pattern of CKD in India has been sporadically studied [8-14]. There are no national or regional reports on incidence or prevalence of both CKD and end-stage renal disease (ESRD) [15]. Forty million people in Western Europe have been found to have CKD [16]. This has been an increase in the number of patients receiving renal replacement therapy (RRT) by 23% from year 2006 to 2015 [17-19]. The epidemiology of ESRD is fairly well documented, but data on chronic kidney disease (CKD) is missing, especially when we talk about Central and Eastern Europe (CEE [20]. National Health and Nutrition Examination Survey have stated that the prevalence of CKD is about 12-20% [21-23].

Whilst there are already International and National transplantation registries, such as the Heidelberg-based Collaborative Transplant Study, the US Scientific Registry of Transplant Recipients and the ANZDATA registry in Australia and New Zealand, no European or Indian renal transplantation database is there to document the precise epidemiology of renal diseases.

It has been estimated that the age-adjusted incidence rate of ESRD in India is about 229 per million population (pmp) [24], and >100, 000 new patients enter renal replacement therapy programs every year in India [25] which is quite disturbing as India being a developing country, many people do not have the luxury of healthcare facilities. The lack of community-based screening programs has led to patients being detected with CKD at an advanced stage. Early detection of kidney disease through community based screening programs might have an impact on this problem through earlier intervention [26].

The Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) has stated that kidney disease does have a major effect on global health, both as a direct cause on morbidity and mortality and also as a major risk factor for cardiovascular disease. CKD is largely preventable and treatable and deserves a much greater attention in global health policy decision making, particularly in locations where the maximum population belongs from low and middle socioeconomic strata [27].

In India as we have no renal registry or any standardized diagnostic method due to which the actual burden of disease is still unknown and it varied widely from 2.9% to 16.54% as estimated by different authors in their studies using different methods [35-37]. Diabetes and CKD have a similar prevalence in the general population, and parts of the clinical outcomes of diabetes are accounted for by CKD triggered by this disease [38].

The traditional risk factors for CKD includes Diabetes (DM), Hypertension (HTN), and a positive family history of CKD to list the few major ones [39]. India has the largest number of people with diabetes in the world, with the projected figure of 57.2 million cases to reach by 2025 [40]. The numbers of people with HTN are expected to double from year 2000 to 2025. These together will make India the reservoir of kidney disorders [41-43]. In India, diabetes and hypertension are responsible for 40% to 50% of all cases of chronic renal failure in current times where sedentary lifestyle is prevailing [44]. Obesity has also been described by many authors as an independent risk factor of CKD and its progression [45]. The current obesity epidemic has the potential for huge increase in CKD and hence affecting the health-care burden [46]. Moreover, due to its asymptomatic nature, CKD is generally detected at advanced stages, resulting in the loss of opportunities to influence its future course of outcome. Progression of CKD and its complications can be delayed through early detection and treatment [47]. It has been well documented that physiotherapy helps in weight management, lowering blood glucose levels, lowering cholesterol levels and maintaining blood pressures in normal ranges, hence, lowering cardiovascular mortality and morbidity. So, if started in early phases, physiotherapy can not only prevent CKD but can also limit its progression.

In many cases haemodialysis (HD) is used to compensate for lost renal function. However, despite technological advancements, patients still have dysfunctions such as anaemia, cardiomyopathy, depression, systemic arterial hypertension, metabolic and respiratory alterations, early fatigue, mental compromise, peripheral circulatory deficits, and mental and muscular alterations, thus reducing their quality of life [28, 29]. It is known that a loss of muscle mass is associated with morbidity and mortality. The quantity of muscle fibres are strongly correlated with muscle strength, muscular oxygen extraction capacity, and functional capacity in dialysis patients [30]. Diaphragm and intercostal muscles also experience decreases in endurance and strength. Pulmonary complications in chronic renal failure (CRF) patients include pulmonary oedema, pleural effusion (mainly in terminal CRF patients), fibrosis, pulmonary and pleural calcification, pulmonary hypertension, capillary and pulmonary blood flow decreases, and hypoxemia [31]. Therefore, patients with CKD have less physical and functional capacity than the general population, and HD treatment limits the activity of these patients, which exacerbates functional limitations [32]. The literature shows that physiotherapy during the intradialytic period and during the intermission sessions in CRF patients produces better functional capacity, blood pressure control, cardiac function, and muscular strength and resistance, in addition to being a motivational factor and providing a break from the monotony of treatment, which can be an effective psychosocial intervention. The practice of regular physical exercise decreases the prevalence of associated diseases and systemic complications [33, 7]. Alterations in the muscular respiratory, mechanical ventilatory, and pulmonary gas exchange functions are common in patients with CKD. This pulmonary dysfunction can be due to the direct effects of circulating toxins or the indirect effects of volume overload, anemia, immunosuppression, hypercalcemia, malnutrition and muscular weakness. Therefore, it is important to implement respiratory muscular training exercises [34]. There have been a lot of studies showing the success stories at improving quality of life and fitness level in terms of both orthopaedic and cardiopulmonary endurance in CKD patients but there's a severe lack of post renal transplant physiotherapy studies probably because the referral rate post-transplant is low. One thing we need to understand is that the burden of cardiovascular mortality and morbidity in patient post-transplant remains high and physiotherapy does help to reduce it considerably.

Hugo Machado Sanchez et al conducted a research in Brazil, in 2018, in which they recruited 51 individual, both male and female to find out the influence of intradialytic physiotherapy on the quality of life and respiratory function in chronic renal patients. They made them go through an eight week structured physiotherapy protocol. After this period they found an improvement in QOL, maximum peak inspiratory flow, reduction in oedema, pain and cramps [48]. In the Rocha et al. study, it was observed the significant improvement of the peak expiratory flow, maximum expiratory pressure and inspiratory pressure after the physiotherapy performance, justified by the balance between the removal of fluids during the dialysis and the bronchoconstriction due to the biocompatibility of dialysis membrane and by the lung expansion capacity through simple and effective techniques of diaphragmatic breathing [49]. Different modalities exist for renal replacement therapy (RRT), such as hemodialysis and peritoneal dialysis; however, kidney transplantation (KT) remains the treatment of choice for ESRD as it leads to longer survival and superior quality of life. [50] It is estimated that in India, 3500 patients undergo renal transplantation, 3000 new patients are put on continuous ambulatory peritoneal dialysis, and more than 15, 000 patients begin maintenance hemodialysis in a year [51].

Despite transplantation, patients maintain high cardiovascular morbidity and mortality compared to the general population [52]. Due to the use of steroids and immunosuppressive drugs, suboptimal renal function and weight gain are often present in renal transplantation patients [53]. The nutrition in RTR may increase the frequency of infection and accelerate the atherosclerotic process [54]. Moreover, it has long been observed that a sedentary lifestyle is an important factor influencing the increase in cardiovascular mortality, particularly when associated to arterial hypertension, diabetes, and other cardio-metabolic risk factors, such as dyslipidemia [55].

Impairments and complications such as uremic myopathy in the fifth stage of chronic kidney disease, reduced glucose utilization caused by aerobic glycolysis disorders, protein-energy malnutrition, impaired immune defense mechanisms, increased oxidative stress and neurohormonal disorders have been reported in patients with CKD and posttransplant renal patient. Corticosteroids, used as part of immunosuppressive therapy after transplant, often result in numerous adverse effects, including weight gain, osteoporosis, and sarcopenia. Other impairments include easy fatigability, loss of appetite, swelling around the ankles and lower legs, difficulty in breathing and shortness of breath which could consequently

lead to physical inactivity [56]. Until now, RTRs have been considered a fragile population, with no specific indications for physical activity. The literature more recently reported the positive effect on body composition and quality of life in the case of supervised combined exercise [57].

Physical activity is protective for many of the risk factors that lead to mortality in kidney post-transplant patients. The primary cause of mortality among kidney transplant recipients is cardiovascular disorders (CVD). Risk factors for CVD include hypertension, diabetes mellitus, hyperlipidemia, smoking, diet, obesity, and sedentary behaviors that can be ameliorated by regular exercise. An important aspect is that increase physical activity improves quality of life of patients. Increase physical activity in kidney transplant population could have a number of beneficial health implications. Regular physical exercise improves blood circulation and lowers blood pressure and heart rate at rest and during exercise. Exercise acts as a stimulant on the endothelium of blood vessels and stimulates the growth of muscle and bone mass, affects metabolic processes of oxidation of glucose and fatty acids, and lowers cholesterol. Physical exercise regulates the secretion of systemic hormones through adipose tissue, reduces oxidative stress and influences the secretion of cytokines [58, 59]. However, the role of exercise after kidney transplantation appeared not to have been well emphasized. There is no uniform agreement among transplant professionals about the need for recommending exercises and on the required of exercise prescription after kidney transplantation [56].

Studies showed generally low rates of exercise protocols post-transplantation; randomized trial of exercise training, 36% of kidney recipients in the usual-care group exercised compared with 67% of the exercise-intervention group at 1 year post transplantation [60]. Fear of injuring the transplanted graft and wound site rupture are few of the factors experienced by patients post-transplant [61, 62]. Patients of diverse ethnic and cultural backgrounds may place differential values on exercise and self-care [63] Many health care professionals fails to promote renal rehabilitation as a part of routine, in post-transplant patients and the belief that other medical issues are more important than exercise [64, 65].

By 2030, the number of people receiving RRT around the world is projected to increase to 5.4 million. Most of this increase will be in the developing countries of Asia and Africa [67, 68]. The need to introduce a structured renal post-transplant rehabilitation is the need of the hour as number of patient undergoing renal transplant are dramatically rising and expected to peak in coming years. A good rehabilitation programme ensures less morbidity and mortality, better Quality of life, reduced risk of post-operative complications, faster recovery and normalcy in life.

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