



# A Prospective and Comparative Study of Hemodialysis, Hemodiafiltration and Renal Transplant by Measurement of Quality of Life in Chronic Kidney Disease Patients

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Received: 15 Jan 2022 / Accepted: 6 March 2022/ Published online: 01 April 2022

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## Abstract

**Background:** Chronic Kidney Disease (CKD) is defined as malfunction of kidney structure in the last 3 months or more than 3 months. There are more than 850 million people suffering with kidney disease, which is increasing annually. In worldwide, 422 million peoples are suffering from diabetes, 42 million people develops the cancer in CKD patients 36.7 million people who are living with AIDS/HIV. The aim of the study is to measure the QOL in CKD patients on different treatment modalities of renal replacement therapy. For end stage renal disease (ESRD) the treatment modalities are Hemodialysis (HD), Hemodiafiltration (HDF) & Renal Transplant.

**Materials & methods:** A prospective and comparative study on different treatment modalities of ESRD on single centered study was conducted in a tertiary care hospital, Hyderabad, for a duration of 10 months. In which 55 patients were screened, 30 patients were HD, 15 patients were HDF & 10 patients were Renal Transplant. The study patients were aged 21-80 years, most of the patients were co-diagnoses of Hypertension (HTN) & Diabetes mellitus (DM). **Results:** The "SF-36 Questionnaire" which measures health status of and HD & HDF patients such as physical function, physical role limitations, bodily pain, general health perception, energy/vitality, social functioning, Emotional role limitations and mental health status interfere in the kidney disease patient is better in HDF patients than the HD patients. The clinical parameters such as sr. creatinine, blood urea nitrogen, sodium, potassium, chloride, hemoglobin, RBC & WBC are better in "Renal Transplant patients" than the "HDF patients" than the "HD patients". The LVEF is superior in "Renal Transplant patients" than the "HDF patients" than the "HD patients" at the end of the study. **Conclusion:** When considering the different treatment modalities of CKD, HDF is the most effective treatment than HD. The renal transplant is superior to HDF.

## Keywords

CKD, HD, HDF, QOL, LVEF

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## 1. INTRODUCTION

End Stage Renal Disease (ESRD) is the last stage of chronic kidney disease (CKD) and mainly demonstrate as an evident to decrease in renal

function.<sup>[1]</sup> Etiological factors like Diabetes mellitus (DM), Hypertension (HTN), glomerulonephritis.<sup>[2]</sup> CKD was well known disease, which requires Renal Replacement Therapy (RRT) such as HD, HDF,

Peritoneal dialysis (PD) and continuous renal replacement therapy (CRRT).<sup>[3]</sup> The concept of HD was based on diffusion process of solutes across the semi permeable membrane which is effective in removing small solutes like urea and creatinine,<sup>[4]</sup> whereas HDF concept is on combined convective (ultrafiltration) and diffusive therapies<sup>[5]</sup> which removes solutes like higher molecular weight, such as  $\beta_2$  micro globulin (911.8 kDa)<sup>[6]</sup> which causes amyloidosis. Renal transplant is a surgical procedure which is done to replace a diseased kidney with a new healthy kidney from a donor. Healthy organs can be received from deceased organ donors and from family members.<sup>[7]</sup>

A prospective study was conducted in CKD patients using cases in a span of 6 months in a tertiary care hospital. The physical health, mental health, socio-demographic profile showing high QOL score in HDF patients compared to HD, which is contradicting with the results of Mohamed Said Abdel salam et.al.,<sup>[8]</sup> showed that there is no significant difference between the two treatment modalities, HF-HD, and OL-HDF, in improving mortality.

G Parthasarathi et.al, A cross-sectional study was conducted in 2008 to assess the quality of life (QOL) of hemodialysis patients ( $n = 75$ ), renal transplant ( $n = 39$ ), asthma patients ( $n = 35$ ), and healthy individuals from the general population ( $n = 300$ ) are presented. The QOL of hemodialysis patients is considerably impaired compared to that of healthy subjects, especially with respect to the physical, psychological and social relationship domains. Renal transplant patients have better QOL in all the four dimensions of the WHOQOL-BREF compared to hemodialysis patients.<sup>[9]</sup>

## MATERIALS & METHODS

This study is a prospective & comparative study conducted in a tertiary care hospital, Hyderabad from September 2021 to July 2022. A total of 55 patients were screened, of whom, 30 were HD patients, 15 were HDF patients & 10 were Renal Transplant patients. Thus HD & HDF patients undergone SF-36 Questionnaire which measures eight domains such as physical function, physical role limitations, bodily pain, general health perception, energy/vitality, social functioning, Emotional role limitations and mental health status interfere in the kidney disease. The clinical data of parameters such as sr. creatinine, blood urea nitrogen, sodium, potassium, chloride, hemoglobin, RBC & WBC to evaluate the difference outcome of CKD patients.

## Inclusion criteria:

CKD patients of both genders who meet the following criteria will be included in the study:

1. Patients aged > 18 years
2. Patients diagnosed with CKD undergoing dialysis (HD & HDF).
3. Patients who undergo renal transplantation.

## Exclusion criteria:

The following patients are not eligible for inclusion in the study:

1. Patients aged < 18 years
2. Female patients who are pregnant
3. Poisoned patients
4. Patients undergoing peritoneal disease

## RESULTS

A total of 55 patients, 30 were HD, 15 were HDF & 10 were Renal transplant patients. Out of 55 patients of participants of HD, HDF & Renal Transplant of male (70%), female (30%), Age of all the participants are 21-30yrs (10.9%), 31-40yrs (7.0%), 41-50yrs (25.5%), 51-60yrs (27.05%), 61-70yrs (23.6%), and 71-2-80yrs (5.5%) & BMI of all the participants are  $26.7 \pm 20.7$ . (Table.1)

It is noted that out of 45 dialysis patients suffering from CKD and are on dialysis for 1-5 years are more. Comorbidities like HTN are major factors to CKD where 37.8% of patient population was with both HTN & DM. Most of the dialysis patients have kidney failure only and have been undergoing dialysis in the last 2-5 years. The patients facing complications during dialysis are more in HD patients than in HDF patients, it is evident that the QOL in HDF is "excellent" than the HD patients.

The QOL of patients improved in HD & HDF in comparison to moderate activities score was limited a little in HDF than the HD Patients whereas in climbing stairs HDF patients are limited a little than the HD patients when compared to limit a lot and not at all limited. The daily activities as a result of physical health in doing less than usual and work limitations in HDF are better than the HD patients. The daily activities as a result of emotional problems in doing less than usual and didn't do work as usual in HDF better than the HD patients because the health condition was better in HDF patients. The interference of pain within the normal work, calmness and feeling energy after dialysis was found more comfortable in HDF than the HD patients because of more clearance in HDF Machine.

The patients feel downhearted, physical and emotional problems interfere in social activities in both HD and HDF; it is found that HDF patients feel better than HD, because as a result of more clearance

in HDF machines. The consequences of kidney disease in life are facing more in HD patients than the HDF patients.

**Table.1: Baseline characteristics of participants**

|                                          | All participants<br>(n=55) | HD<br>(n=30)    | HDF<br>(n=15)   | Renal Transplant<br>(n=10) |
|------------------------------------------|----------------------------|-----------------|-----------------|----------------------------|
| <b>Gender</b>                            |                            |                 |                 |                            |
| Male                                     | 70%                        | 66.7%           | 80%             | 90%                        |
| Female                                   | 30%                        | 33.3%           | 20%             | 10%                        |
| <b>Age</b>                               |                            |                 |                 |                            |
| 21-30yrs                                 | 10.9%                      | 16.7%           | 6.7%            | 0%                         |
| 31-40yrs                                 | 7.0%                       | 3.3%            | 0%              | 30%                        |
| 41-50yrs                                 | 25.5%                      | 23.3%           | 20%             | 30%                        |
| 51-60yrs                                 | 27.5%                      | 26.7%           | 33.3%           | 30%                        |
| 61-70yrs                                 | 23.6%                      | 23.3%           | 33.3%           | 10%                        |
| 71-80yrs                                 | 5.5%                       | 6.7%            | 6.7%            | 0%                         |
| <b>Body Mass Index, Kg/m<sup>2</sup></b> | <b>26.7±20.7</b>           | <b>23.7±4.8</b> | <b>24.3±4.6</b> | <b>39.4±47.4</b>           |

The difficulties facing due to dialysis like soreness in muscles, chest pain and cramps in HD patients are facing more than the HDF patients because the fluid overload, potassium build up in the body of HD patients was more and clearance is less than the HDF patients. Itchy skin, dry skin, SOB in HD patients is facing more than the HDF patients.

Faintness, lack of appetite & being washed out are facing more HD patients than HDF patients. Stress and ability to travel, the patients who were on HD machine bothered them more than the HDF patients. Begin dependent on medical staff and physical appearance in HD & HDF patients were bothering more than the HDF patients.

“The SF-36 Questionnaire” Scoring that the quality of life of HDF patients is better than the HD patients.

The findings of clinical parameters of sr. Creatinine in HD patients were 7.3±0.4, in HDF patients 8.9±12.1, and in renal transplant patients 1.1±0.2, which demonstrates that, the sr. Creatinine levels were decreased in renal transplant than the HDF patients than the HD patients. Blood urea nitrogen (BUN) found in HD patients was 103.1±13.0, in HDF patients 103.6 ± 9.9 and in renal transplant patient 22.9±2.7 which demonstrates the BUN levels also decreased in

renal transplant than the HDF patients than the HD patients.

The sodium levels in HD patients were 134.7±0.6, in HDF patients 135.5±0.6, and in renal transplant patients 113.2±23.5, which evident that, the sodium levels were changing upon different treatment modalities of HD, HDF & Renal transplant. The potassium levels in HD patients were 5.3±0.1, in HDF patients 5.2±0.1, and in renal transplant patients 2.0±0.9, which demonstrating the potassium levels came to normal after renal transplantation. The chloride levels in HD patients were 101.6±1.0, in HDF patients 5.2±0.1, and in renal transplant patients 50.8±21.7, which is evident that the chloride levels were also changing on different treatment modalities of CKD. The hemoglobin levels were found in HD patients were 9.1±0.4, in HDF patients 10.4±0.3, and in renal transplant patients 13.9±1.9, the RBC levels were found in HD patients were 3.2±0.0, in HDF patients 3.6±0.1, and in renal transplant patients 3.0±0.9, The WBC levels were found in HD patients were 10.9±0.4, in HDF patients 10.8±0.9, and in renal transplant patients 4.9±1.8. The Hemoglobin, RBC & WBC levels were changes in between treatment modalities of CKD.

**Table.2: Findings of Clinical Parameters in duration of 6 months**

|                                | HD (n=30)  | HDF (n=15) | Renal Transplant (n=10) |
|--------------------------------|------------|------------|-------------------------|
| Serum creatinine, mg/dl        | 7.3±0.4    | 8.9±12.1   | 1.1±0.2                 |
| Blood Urea Nitrogen, mg/dl     | 103.1±13.0 | 103.6±9.9  | 22.9±2.7                |
| Sodium, mmol/L                 | 134.7±0.6  | 135.5±0.6  | 113.2±23.5              |
| Potassium, mmol/L              | 5.3±0.1    | 5.2±0.1    | 2.0±0.9                 |
| Chloride, mmol/L               | 101.6±1.0  | 100.5±1.0  | 50.8±21.7               |
| Hemoglobin, g/dL               | 9.1±0.4    | 10.4±0.3   | 13.9±1.9                |
| RBC, millions/mm <sup>3</sup>  | 3.2±0.0    | 3.6±0.1    | 3.0±0.9                 |
| WBC, thousands/mm <sup>3</sup> | 10.9±0.4   | 10.8±0.9   | 4.9±1.8                 |

In 2D echo the Left ventricular ejection fraction is improving in HDF patients than in HD, & the left ventricular ejection fraction is improving after transplantation.

## DISCUSSION

Quality of life plays a significant role in patients with CKD, however different treatments modalities are used to manage CKD, but better treatment modalities are assessed for long term QOL in CKD patients. Physical health, mental health, work situations, social life and diseased condition are the main factors to assess the quality of life in CKD patients. CKD modify the life style of patients, which is affecting major part of life including physical health, social life, mental health and work situation. Age is a major risk factor for patients affecting CKD. From minor complications like UTI to major complications include glomerular nephritis resulting to CKD and co-morbid condition like hypertension, diabetes mellitus worsening the disease.

A prospective study was conducted in CKD patients using cases in a span of 6 months in a tertiary care hospital. SF36 questionnaire tool used to assess the quality of questions which were asked to patients undergoing HD and HDF during the study. Impact of dialysis sessions on patients' QOL is a significant measurement, whether the complications seen or improvements are noted and analyzed

In our study, out of 45 patients, 30 patients underwent HD and 15 patients underwent HDF. 19 HD patients (63%) are suffering from CKD about 1 to 5 years, 6 HDF patients (40%) are suffering from CKD about 2 to 5 years. Almost half of the patients have comorbidities like HTN and DM.

Kidney failure is the reason for undergoing dialysis among all the HD and HDF patients. The associated complications during dialysis were 10% less observed in HDF patients compared to HD.

In the assessed patients, physical health showing high QOL score in HDF patients compared to HD. The mental health of the patients hypothesize high QOL score in HDF patients than in HD patients. The socio-demographic profile is limited in HD Patients compared to HDF patients. This is the unique finding of the study, which is contradicting with the results of Mohamed Said Abdel salam *et.al.*, showed that there is no significant difference between the two treatment modalities, HF-HD, and OL-HDF, in improving mortality. Future randomized clinical trials including larger number of patients studying the effect of dialysis modality on outcomes are needed.<sup>[10]</sup>

Among CKD patients, LV dysfunction is detectable in almost all patients, for this 2D echo ejection fraction

value was used to evaluate LV function. Investigated 2D echo ejection fraction values express that LV function is more effected in HD patients, i.e., decreased to 27% of heart function (normal 50-75%), whereas in HDF patients the LV function was affected up to 42%. In renal transplant patients the LV function before renal transplantation decreased to less than 30 % and after renal transplantation it improved up to 65% of the ejection fraction.

Observations of Raja. A. A et al shows Left ventricular systolic dysfunction and moderate to severe valve disease are common and often unrecognized in patients with end-stage kidney failure on hemodialysis and are associated with a higher risk of death. For more than 10% of the patients included, systematic echocardiographic assessment had a potential clinical consequence.<sup>[11]</sup>

Decreased Sr. Creatinine and blood urea nitrogen value observed in HDF Patients compared to HD patients. Decrease in Sr. Creatinine and blood urea nitrogen value observed in Renal Transplant patients compared to HD & HDF.

In our study there was an increase in Serum electrolytes and hemoglobin levels were observed in renal transplant patients compared to HD & HDF. There were no studies reported on this observation.

## LIMITATIONS

In our study the limitations are questionnaire was not asked to same patients who were previously underwent HD, changed to HDF and the patients treated with HD or HDF underwent renal transplant. Most of the patients didn't undergo regular 2D echo which became barrier to evaluate their cardiovascular function in depth.

## CONCLUSION

A Prospective and Comparative study was conducted on QOL in HD, HDF & Renal Transplant in OP dialysis patients, in a tertiary care hospital.

Based on the results of this study the following conclusions were made

- ✧ The "SF-36 Questionnaire" which measures health status of HD & HDF patients such as physical function, physical role limitations, bodily pain, general health perception, energy/vitality, social functioning, Emotional role limitations and mental health status interfere in the kidney disease patient is better in HDF patients than the HD patients.
- ✧ The clinical parameters such as sr. creatinine, blood urea nitrogen, sodium, potassium, chloride, hemoglobin, RBC & WBC are better in "Renal Transplant patients" than the "HDF patients" than the "HD patients".

- ✧ The LVEF is superior in “Renal Transplant patients” than the “HDF patients” than the “HD patients”.

### SUMMARY

Chronic Kidney Disease (CKD) is a dysfunction of kidney structure, which is caused by DM, HTN. The increased creatinine levels and eGFR measures the kidney failure stage. They are 5 stages of CKD; the 5th stage of CKD is called ESRD. The treatment of ESRD is dialysis, they are different types of dialysis namely, HD, HDF, Peritoneal Dialysis, CRRT.

A Prospective and Comparative study was conducted to measure the QOL in HD, HDF & Renal Transplant of CKD patients after taking ethical approval from the institution, Ethical Committee from a tertiary care hospital.

A Questionnaire SF-36 along with information leaflet was appeal to OP patients who are undergoing HD, HDF treatment. From 45 patients, we collected HD & HDF questionnaire data.

Out of 45 patients, 30 are HD patients and 15 are HDF patients. Out of 45 patients 24 (53.3%) have been suffering from CKD for 1-5 yrs. Out of 45 patients 17 (37.8%) have had comorbidities like HTN & DM.

Both HD & HDF patients are undergoing dialysis due to kidney failure. The complications during dialysis process were observed in HD patients are 14 (46.6%) whereas in HDF patients 5 (33.33%). The ability of HD patient's activities like moving a table, heavy lifting is 18 (60%) are not able to do whereas in HDF patients 3 (20%) are not able to do.

The HD patients those who are not climbing the stairs are 20 (66.66%) where as in HDF patients are 3 (20%). The HD patients who are worried about kidney disease interfering in their life's are 5 (16.6%) are extremely bothered whereas in HDF patients none of the patients are extremely bothered.

The HD patient's ability to travel is 8(26%) are extremely bothered whereas in HDF patients none of the patients are extremely bothered. The fluid restriction in HD patients is 10(33.3%) are extremely

bothered whereas in HDF patients 1(6.66%) are very bothered.

The clinical parameters like sr. creatinine, BUN, sodium, potassium, chloride, hemoglobin, RBC & WBC came to normal on different treatment modalities of CKD.

Different modalities of renal replacement therapy show the superior treatment in “Renal Transplant patients” than the “HDF patients” than the “HD patients”.

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