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Original Research Article

Comparison of clinical outcomes of conventional hemodialysis and online hemodiafiltration

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ABSTRACT

Background: Several studies have suggested that online hemodiafiltration (OL-HDF) may reduce the risk of mortality and improve quality of life of these patients compared with standard hemodialysis.
Methods: Forty stable out patients on dialysis (20 patients on hemodialysis and 20 patients on online hemodiafiltration) above age of 18 years and dialysis vintage of more than 3 months were followed up for 18 months. Clinical, biochemical parameters of these patients along with the SF-36 score at baseline and after 18 months of follow up were assessed.
Results: At 18 months, statistically significant difference was found between hemodialysis (HD) and OL- HDF groups in erythropoietin dose (p=0.047), urea reduction ratio (p=0.016), Kt/V (p=0.005), hemoglobin (p=0.043), serum albumin (p=0.002), phosphorus (p=0.024), parathyroid hormone (p=0.007), potassium (p=0.007), β_2 microglobulin (p=0.002), high sensitive c-reactive protein (p=0.037), and serum bicarbonate levels (p=0.022). We found statistically significant difference in intradialytic complications namely intradialytic hypotension, muscle cramps, simultaneous hypotension and muscle cramps and stoppage of dialysis. In terms of mortality, the difference was not statistically significant (p=0.052).
Conclusions: Patients on OL- HDF were having better quality of life than patients on HD. Better solute clearance, anemia control, improved nutritional and Mineral bone disorder parameters were seen in OL-HDF. Less complications during dialysis were seen with OL-HDF. The difference in mortality rate between the HD group and OL- HDF group was not statistically significant.

Keywords: Hemodiafiltration, Hemodialysis, Online, Outcome

INTRODUCTION

Conventional hemodialysis clears uremic toxins mostly by diffusion which is inversely proportional to the radius of the toxin molecule. As a result, conventional hemodialysis clears larger toxin molecules less effectively than smaller ones. Clearance of larger toxins is limited by their low rate of diffusion, even if they can easily pass through the pores in the dialyzer membrane.[1] In contrast, hemodiafiltration (HDF) increases the clearance of larger toxins by large-volume ultrafiltration. Ultrafiltration carries toxins through the membrane pores by fluid flow, also known as convection. As middle molecules clearance in HDF occurs through convection, so requires the infusion of significant amounts of infusate to replace the ultrafiltrate. This infusate fluid must be sterile and pyrogen free (ultrapure) since it is infused directly into the blood. For chronic renal replacement therapy, infusate is generated by the dialysis machine, which is much less expensive than using bagged fluid. This is referred to as online HDF. Online hemodiafiltration (OL-HDF) is an alternative to conventional hemodialysis (HD) proposed for end-stage renal disease (ESRD) patients, with the aim of improving patient outcomes in terms of morbidity, quality of life, and mortality.[2]

Quality of life (QoL) has been defined as the presence of physical, mental and social wellbeing.[3] Different techniques can be used to measure patient's QoL. In dialysis care, patients are often asked to complete a questionnaire which comprises of multiple domains.[4] The most widely used questionnaire to assess generic QoL in dialysis patients is the short form 36 (SF-36).[5,6]

Apart from poor survival of hemodialysis patients, their quality of life is also hampered. Their QoL is comparatively lower than the patients with respiratory or coronary disease, arthritis or metastatic colorectal cancer.[7]

The primary objective of the study wais to compare clinical outcomes and quality of life of patients undergoing hemodialysis and online hemodiafiltration.

METHODS

We conducted a prospective observational study at our centre, Manipal Hospitals, Bangalore, over 2 years from May 2018 to May 2020 where 40 patients were studied, 20 patients in each group- hemodialysis (HD) and online hemodiafiltration (OL-HDF). The patients were randomly assigned to these two groups. Ethics committee approval for the same was given by the institutional ethics committee of Manipal Hospitals, Bangalore. Patients on hemodialysis or online hemodiafiltration for more than 3 months and above 18 years of age were included in the study. Dialysis information like dialysis vintage, inter-dialytic weight gain, residual kidney function, access for dialysis, ESA usage. Laboratory parameters like pre and post BUN, single pool Kt/V by Daugridas formula, hemoglobin, serum albumin, serum calcium, serum phosphorous, PTH, serum potassium, serum bicarbonate, total cholesterol were measured at baseline and at 18 months. Beta 2 microglobulin, and HS CRP were measured at baseline, after 6 months and at 18 months. Quality of life was measured at baseline and at 18 months using SF 36 score in the two groups were analysed.

Patients who were less than 18 years of age, those on twice a week dialysis, those on peritoneal dialysis, those with AKI requiring hemodialysis were excluded from the study. The dialysis equipment used for conventional dialysis was Fresenius 4008S Next Gen. Hemodialysis was done with a blood pump speed of 250-300 ml/minute and dialysate flow of 500 ml/minute with a polyflux 17L dialyser. Machine for online HDF was Fresenius 5008 functioning at a blood pump speed of 300-350 ml/minute, dialysate flow of 360 ml/minute which amounts to an HDF factor of 1.2 via a Polyflux H dialyser. Ultrafiltrate in HD was kept not more than 4 l/session over a 4 hours session while the total ultrafiltered volume in post dilution mode in OL-HDF was targeted to 20-24 liter per session (85-90 ml/kg per hour).

Data was entered into Microsoft Excel sheets, and analysis was done using IBM SPSS statistics 21.0. Results on continuous measurements were presented as mean±SD and association between two groups was tested using Student t-test (two-tailed, independent). The effects on categorical measures shown in percentages and associations were tested using the chi-square test with or without Yate's correction depending on the cell frequency. Hazard ratio was calculated for comparing the complications in events person years.

Significance was assessed at a probability of a 5% level. If the probability value was less than 5% ($p<0.05$), there was evidence to reject the null hypothesis, the two means are significantly different at the significance level reported by the p value, and if the probability value was more than 5% ($p>0.05$), null hypothesis was accepted to say that the two means were not different.

RESULTS

The mean age of patients in our study was 67.6±8.35. In the HD group mean age of the patients was 65 years (age range 53 to 78 years), whereas mean age in the OL-HDF group was 70 years (age range 52 to 82 years) (Table 1).

Table 1: Age wise distribution of the patients.

Age (in years)	Conventional hemodialysis N (%)	Online hemo-diafiltration N (%)	Total N (%)
51-60	7 (35)	4 (20)	11 (27.5)
61-70	8 (40)	4 (20)	12 (30)
>70	5 (25)	12 (60)	17 (42.5)
Total	20 (100)	20 (100)	40 (100)
Mean±SD	65.1±6.77	70.2±9.15	67.6±8.35

Table 2: Gender wise distribution of the patients.

Gender	Conventional hemodialysis	Online hemo diafiltration	Total
	N (%)	**N (%)**	**N (%)**
Female	5 (25)	6 (30)	11 (27.5)
Male	15 (75)	14 (70)	29 (72.5)
Total	20 (100)	20 (100)	40 (100)

Of the 20 patients on hemodialysis, 15 (75%) were males and 5 (25%) were females. In 20 patients on online hemodiafiltration, 14 (70%) were males and 6 (30%) were females (Table 2). The mean BMI (kg/m^2) of patients in our study was 24.2 (24 kg/m^2 in HD group versus 24.4 kg/m^2 in OL-HDF group), which was not significant statistically ($p=0.755$). The most common cause of ESRD in our study was diabetic nephropathy followed by CGN. Out of overall 40 patients, 26 (65%) patients had diabetic nephropathy, 4 (10%) patients had chronic glomerulonephritis (CGN), 3 (7.5%) patients had chronic interstitial nephritis (CIN), 3 (7.5%) patients had ADPKD, 2 (5%) patients had IgA, 1 (2.5%) patient had MGN, and 1 (2.5%) patient had TMA. On comparing the two groups with respect to prevalence of diabetic nephropathy, 15 (75%) patients on hemodialysis group had diabetic nephropathy, and 11 (55%) patients on online hemodiafiltration group had diabetic nephropathy and the difference between the groups was not significant statistically (p=0.185; NS) (Figure 1).

Out of 40 patients in our study, 25(62.5%) patients had ischemic heart disease [14 (70%) patients in HD group vs 11 (55%) patients in OL-HDF group]; 35 (87.5%) patients were diabetics [19 (95%) patients in HD groups 16 (80%) patients in OL- HDF group] and all 40 (100%) patients were hypertensive. There was no statistically significant difference in comorbid conditions between the two groups (Table 3).

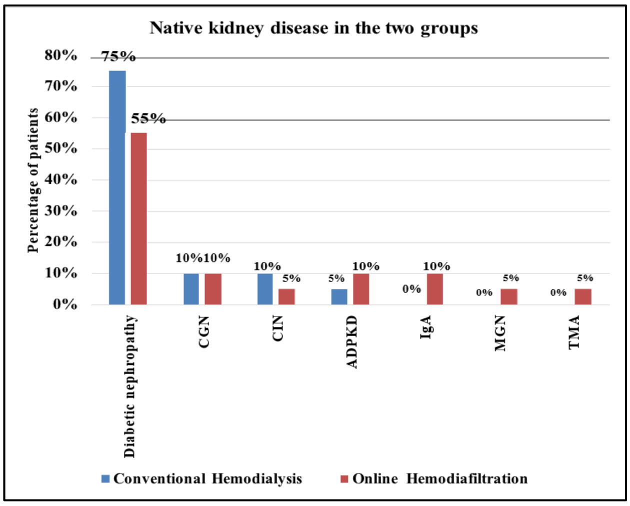

Figure 1: Native kidney disease in the two groups of patients.

Table 3: Co-morbid conditions in the two groups of patients.

Co-morbid conditions	Conventional hemodialysis (n=20)	Online hemodiafiltration (n=20)	Total (n=40)	P value
	N (%)	N (%)	N (%)	
Ischemic heart disease	14 (70)	11 (55)	25 (62.5)	0.327; NS
Diabetics	19 (95)	16 (80)	35 (87.5)	0.339; NS
Hypertension	20 (100)	20 (100)	40 (100)	1.000; NS

Table 4: Baseline characteristics.

Baseline Variables	Conventional hemodialysis	Online hemodiafiltration	P value
Residual Urine output (ml/day)	35±85.3	310±566.5	<0.001 (S)
ESA dose IU/week	13000±3376.4	9100±2700	<0.001 (S)
Ejection fraction %	49.8±8.22	49.2±9.50	0.832 (NS)
Pre HD-BUN (mg/dl)	45.3±8.23	46.3±9.54	0.725 (NS)
Post HD BUN (mg/dl)	11.75±3.14	9.26±2.72	0.01 (S)
URR %	74.4±4.77	78.6±2.80	0.002 (S)
Kt/V	1.70±0.26	1.87±0.17	0.019 (S)
Hemoglobin (g/dl)	9.88±1.44	11.7±0.84	<0.001 (S)
Albumin (g/dl)	3.43±0.31	3.65±0.35	0.042 (S)
Calcium (mg/dl)	8.63±0.45	8.6±0.57	0.854 (NS)
Phosphorous (mg/dl)	5.46±1.67	4.67±1.30	0.103 (NS)
PTH (pg/ml)	344.7±173.9	255.7±108.8	0.06 (NS)
Potassium (mEq/l)	5.49±0.43	5.08±0.46	0.006 (S)
β_2 microglobulin (mgs/l)	38.7±10.2	22.5±8.45	<0.001 (S)
HS CRP (mg/dl)	1.33±0.87	0.59±0.51	0.002 (S)
Bicarbonate (mEq/l)	18.8±2.45	20.8±1.87	0.006 (S)
Total cholesterol (mg/dl)	118±15.4	126.8±11.97	0.051 (NS)

S=Significant, NS=Not significant

The mean dialysis vintage in our study population was 42.1 months (45.7 months in HD group 38.6 months in OL- HDF group) and the difference was not significant statistically (p=0.455; NS). The average interdialytic weight gain in our study was 3.5 kg (3.7 kg in HD group vs 3.4 kg in OL-HDF group) and the difference was not significant statistically (p=0.147; NS)

At 18 months follow-up, out of 20 patients on conventional hemodialysis 11 patients died, one underwent transplant and 8 patients were remaining. Out of 20 patients on online hemodiafiltration 5 patients died, 1 patient shifted centres and 14 patients remained in the study.

Table 5: Characteristics after 18 months follow up in the two groups.

Variables at 18 months	Conventional hemodialysis (n=8)	Online hemodiafiltration (n=14)	P value
Residual urine output (ml/day)	0±0	214.3±458.9	0.206 (NS)
ESA dose IU/week	11000±5291.5	7142.9±3324.9	0.047 (S)
Ejection fraction %	50.5±6.21	48.4±5.92	0.431 (NS)
Pre HD BUN (mg/dl)	41.4±6.11	39.9±9.49	0.690 (NS)
Post HD BUN (mg/dl)	10.6±2.92	8.29±2.49	0.060 (NS)
URR %	74.7±4.29	79.2±3.69	0.016 (S)
Kt/V	1.71±0.20	1.92±0.24	0.005 (S)
Hemoglobin (gm/dl)	10.3±1.09	11.3±0.99	0.043 (S)
Albumin (gm/dl)	3.23±0.31	3.73±0.33	0.002 (S)
Calcium (mg/dl)	8.41±0.42	8.84±0.60	0.088 (NS)
Phosphorous (mg/dl)	5.70±1.33	3.90±1.82	0.024 (S)
PTH (pg/ml)	339.5±147.4	316±114.6	0.007 (S)
Potassium (mEq/l)	5.50±0.48	4.79±0.72	0.022 (S)
B_2 microglobulin (mgs/l)	39.8±6.95	27.1±8.50	0.002 (S)
HS CRP (mg/dl)	1.13±0.59	0.61±0.48	0.037 (S)
Bicarbonate (mEq/l)	17.8±2.66	20.1±1.73	0.022 (S)
Total cholesterol (mg/dl)	119.9±38.2	122.6±11.8	0.802 (NS)

S=Significant, NS=Not significant

Table 6: Baseline SF 36 scores in the two groups of patients.

SF 36 scores at baseline	Conventional hemodialysis	Online hemodiafiltration	P value
Physical functioning	32.3±14.2	45.5±18.6	0.015 (S)
Role limitation due to physical health	33.8±12.2	41.3±12.2	0.060 (NS)
Role limitation due to mental health	53.3±16.8	60.0±13.7	0.176 (NS)
Energy/Fatigue	58.0±5.23	64.8±9.1	0.007 (S)
Emotional well being	55.4±5.39	60.0±7.1	0.027 (S)
Social functioning	56.9±7.56	60.0±8.7	0.233 (NS)
Pain	58.6±9.23	67.8±10.4	0.006 (S)
General health	45.8±6.74	50.5±4.26	0.011 (S)
physical component scale	42.5±9.51	51.1±10.6	0.01 (S)
mental component	55.8±7.17	61.1±8.41	0.038 (S)

S=Significant, NS=Not significant

Table 7: SF 36 scores at 18 months in the two groups of patients.

SF 36 scores at 18 months	Conventional hemodialysis (n=8)	Online hemodiafiltration (n=14)	P value
Physical functioning	32.5±4.63	40.4±10.3	0.056 (NS)
Role limitation due to physical health	25.0±0.00	42.9±11.7	<0.001 (S)
Role limitation due to mental health	33.3±0.00	57.2±15.7	<0.001 (S)
Energy/Fatigue	32.5±13.9	49.6±14.7	0.014 (S)
Emotional well being	35.0±4.14	44.9±8.47	0.006 (S)
Social functioning	25.0±0.00	50.0±12.0	<0.001 (S)
Pain	30.9±11.6	48.9±9.44	0.001 (S)
General health	30.6±1.77	42.1±8.25	0.001 (S)
Physical component scale	29.6±3.65	44.4±8.36	<0.001 (S)
Mental component	31.4±4.30	50.4±10.8	<0.001 (S)

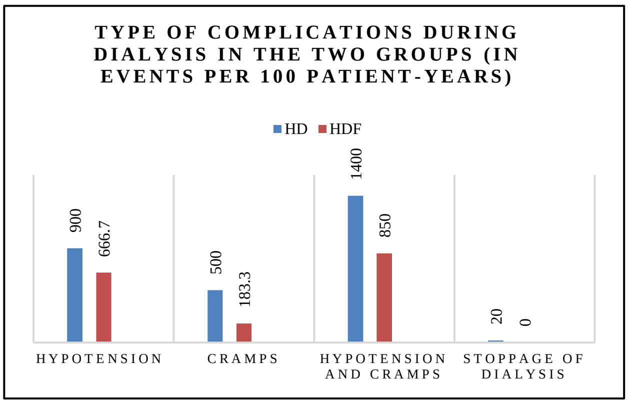

Figure 2: Complications during dialysis in the two groups.

In the HD group, 270 events of hypotension occurred, which accounted for the 900 events per 100 patient-years and in the OL-HDF group, 200 events of hypotension occurred, which accounted for the 666.7 events per 100 patient-years. The difference in hypotension events is significantly lower in the OL-HDF group compared to the HD group. [HR=0.741; 95% CI (0.618-0.888); p=0.001; Significant]. In the HD group, 150 events of muscle cramps occurred, which accounted for the 500 events per 100 patient-years and in the OL-HDF group, 55 events of muscle cramps occurred, which accounted for the 183.3 events per 100 patient-years. The difference in muscle cramps events was significantly lower in the OL-HDF group compared to the HD group. [HR=0.367; 95% CI (0.279-0.482); p<0.001; Significant]. In the HD group, stoppage of dialysis due to complications occurred on 6 occasions, which accounted for the 20 events per 100 patient-years and it never occurred in the OL-HDF group. There was statistically significant between the OL-HDF group and the HD groups [HR=0; 95% CI (0-0); p=0.014; significant].

Out of 40 patients, infections occurred in 23 (57.5%) patients, out of which 14 (70%) patients were in the HD group and 9 (45%) patients were in OL-HDF group. The difference in the infection rate between the HD group and the OL-HDF group was not significant statistically (p=0.1). the difference was not significant statistically (p=0.507; S). Out of 40 patients 30 patients (75%) were hospitalized for various reasons; 16 patients (80%) in HD group versus 14 patients (70%) in OL-HDF group but the difference was statistically not significant p=0.465.

Out of 40 patients in the study 16 (40%) patients expired during the study period; 11 patients (55%) in the HD group and 5 patients (25%) in the OL-HDF group. There was no statistically significant difference (χ^2= 3.75; df=1; P=0.052, not significant)

DISCUSSION

Thrice-weekly hemodialysis (HD) has been considered as a “standard” HD treatment regimen among most nephrologists in the developed countries. We have compared treatment with hemodialysis (HD) and online hemodiafiltration (OL-HDF) in 40 stable patients (20 OL-HDF and 20 HD) for a period of 18 months. Treatment characteristics of both patients are described in the methodology. There aren’t many Indian studies which compare HD versus HDF which highlights the importance and need for our study. At our centre, the criteria for selection of patients for HDF is to those who can afford the same.

At the start of our study, there was statistically significant difference between the two groups in certain parameters like residual urine output (p<0.001), ESA dose (p<0.001), URR (p=0.002), Kt/V (p=0.019), hemoglobin (p<0.001), serum albumin (p=0.042), serum potassium (p=0.006), beta 2 microglobulin (p<0.001), HS CRP (p=0.002) and serum bicarbonate levels (p=0.006) (Table 4). This statistically significant difference in the above parameters at baseline of the study could be due to the pre-study dialysis modality of the patients. The fact that OL-HDF patients had improved residual urine output at baseline indicates that HDF helps to preserve it due to better cardiovascular stability and fewer episodes of hypotension, as seen in our study. HD patients had a dialysis vintage of 45 months and OL-HDF patients 38.6 months. This difference at baseline will also arise as the patients undergoing HDF are those from a better socio-economic background and nutrition. The difference in baseline factors further supports the notion that OL-HDF improves haemoglobin, albumin, potassium, erythropoietin dose, and inflammation in these individuals.

At 18 months, only 8 patients in the HD group (11 patients died and one patient had renal transplantation), and 14 patients in the OL- HDF group (5 patients died and one patient has shifted to another dialysis unit) were followed up. At this point of follow up, statistically significant difference was found between HD and OL-HDF groups in ESA dose (p=0.047), URR (p=0.016), Kt/V (p=0.005), haemoglobin (p=0.043), albumin (p=0.002), phosphorus (p=0.024), PTH (p=0.007), potassium (p=0.007), β_2 microglobulin (p=0.002), HS CRP (p=0.037), and serum bicarbonate levels (p=0.022). In other parameters like residual urine output (p=0.206), left ventricular ejection fraction (p=0.43), calcium (p=0.088), and total cholesterol (p=0.802) levels statistically significant difference was not seen between HD and OL-HDF groups (Table 5). As a result, the superior outcome in OL-HDF patients at the end of 18 months cannot be attributed only to residual renal function, as the difference between the two groups in terms of RRF was no longer statistically significant.

In the prospective, multicentric randomized cross-over study by Pedrini et al to evaluate the effects of long-term on-line HDF compared to low flux HD, on-line HDF showed greater efficiency than low flux HD in removing small solutes (eKt/V urea 1.6±31 versus 1.44±0.26, p<0.0001).[8] It was seen that online HDF was effective in reducing levels of beta2-microglobulin (22.2±7.8 versus 33.5±11.8 mg/l, p<0.0001), phosphate (4.6±1.3 versus 5.0±1.4 mg/dl, p=0.008), parathyroid hormone (202±154 versus 228±176 pg/ml, p=0.03) and c-reactive protein (5.5±5.5 versus 6.7±6.1 mg/l, p=0.03). Few parameters like serum calcium and hemoglobin remained similar in the study groups. The requirement of ESA and phosphate binder doses were lesser in HDF patients.

The study done by Ok et al has also shown that the requirement of ESA was lesser in the OL-HDF group compared to the HD group, to achieve comparable haemoglobin levels (11.7±1.2 in HDF versus 11.3±1 in HD).[9] Small solute clearance was better in the OL-HDF group compared with high-flux HD as confirmed by higher Kt/V values. β_2 microglobulin levels were similar in the two groups which is different from our study. In the above study serum calcium, PTH, and phosphate levels were also similar in both groups.

In our study among the HDF patients, on comparison of baseline characteristics with those after 18 months of study period, we found statistically significant difference in phosphorus and PTH values. In the HDF group, residual urine output was also maintained and the decrease over the 18 months period was not statistically significant (310±566 ml per day pre study versus 214±458 ml per day at 18 months; p=0.561). In another study done by Morena et al, an improvement in the control of metabolic bone disease biomarkers, Kt/V, and beta 2-microglobulin levels were seen.[10] However, no difference in serum albumin concentration and CRP was observed with online hemodiafiltration. The difference in β_2 microglobulin results in different studies are probably due to β_2 microglobulin levels being determined substantially by factors other than the extracorporeal clearance namely residual kidney function and inflammatory state.

Kantartzi et al reported a prospective crossover study involving 24 patients.[11] Each patient received HD, OL-HDF, and HDF with pre-prepared bags of substitution fluid for 3 months, with the dialysis modality subsequently being altered. Quality of life was measured by the SF-36, and subscale scores were calculated. There were statistically significant differences in QOL for the total SF-36, bodily pain score, and role limitations due to emotional functioning in favor of online HDF over low-flux HD (Table 6). Mazairac et al analyzed data of 714 patients from the convective transport study with a median follow-up of 2 years to assess the effect of HDF on quality of life compared with HD.[12] There were no significant differences in changes in HRQOL over time between patients treated with HD (n=358) or hemofiltration (n=356) (Table 7). The inconsistency of these results is probably related to different methods used to assess the quality of life, sample sizes, duration of the study, and the different characteristics of the convective therapy utilized such as blood flow rate, vascular access type, and type of the dialyzer, convection volume, and frequency of online HDF. There is overall decrease in quality of life in both HD and HDF and patients when compared base line quality of life with 18 months, though statistically significant difference seen in both groups at all point of time.

Out of 40 patients in the study, sixteen (40%) patients expired during the study period. There were five (25%) deaths in the OL-HDF group and 11 (55%) in the HD group. Sepsis was the most common cause of death in both the groups. Sepsis contributed to 11 (68.75 %) deaths out of total 16 deaths. Second most common cause of death in our study is ACS, 4 deaths (25%), out of total 16 deaths is due ACS. Though the mortality numbers appeared different, the difference was not statistically significant (p=0.052). The reason for non-significant difference in mortality rate may be due to small sample size and short duration of the study. The reason for high mortality rate in our study is probably due to the more dialysis vintage of our patients (mean dialysis vintage of 45 months in HD group versus 38.6 months in OL-HDF group) and elderly study population (mean age of 65 years in HD group and 70 years in the OL-HDF group). The 4 trials namely the Italian trial by Locatelli et al (146 patients, including 70 low-flux HD, 40 HDF, and 36 hemofiltration), the Turkish trial by Ok et al (782 patients, including 391 high-flux HD and 391 OL- HDF), the Contrast trial done by Grooteman et al (Netherlands, Norway, and Canada) (714 patients, including 356 low-flux HD and 358 HDF), and the Frenchie trial by Morena et al (381 patients, including 191 high-flux HD and 190 HDF), did not show improvement in all-cause mortality after receiving HDF.[10,13-15]

The other ESHOL Trial by Maduell et al with 906 patients (450 high-flux HD and 456 OL-HDF) showed a significant reduction in all-cause mortality (30%), a non-significant reduction in cardiovascular mortality of 33%, and a significant reduction in infection-related mortality (55%) in patients on online post-dilution HDF.[16]

These differences seen in various studies may be due to the different convective volumes, blood flows, different modes of HDF operation, and patient selection bias used in them. There is a need for the further patient or cluster-randomized clinical trials that adhere to high standards of trial conduct and reporting and avoid selection and ascertainment bias that is affecting much of the current literature.

Out of 40 patients, one or more episodes of infections occurred in 23 (57.5%) patients, 14 (70%) in the HD group and 9 (45%) in the OL-HDF group. The difference in the infection rate between the HD group and the HDF group was not significant statistically (p>0.05). Blood stream infection was the most common type of infection in both groups and there were 21 episodes; 12 episodes (57%) in HD group and 9 episodes (43%) in HDF group. In the study done by den Hoedt et al, 31% of the patients suffered from one or more infections requiring hospitalization during the study period. There was no statistically significant difference in the rate of infection in HDF vs HD arms.[17]

Out of 40 patients in our study, 26 (65%) patients had one or more episodes of intradialytic complications [16 (80%) patients in HD versus 10 (50%) in OL-HDF, p=0.047] and it was statistically significant. In the present study the most common intradialytic complication noticed was hypotension (Figure 2).

In a study done by Maduell et al, there were 679.2 intradialytic hypotension episodes per 100 patient-years in the OL HDF group versus 937.7 episodes per 100 patient-years in the hemodialysis group (p=0.001) which was statistically significant. Another study done by Morena et al also showed lesser episodes of intradialytic complications namely hypotension and cramps in the HDF group compared to the HD group.[10,16]

The major drawback of our study was small sample size and shorter duration of study. The other limitation of our study was longer dialysis vintage (45.7 months in HD group and 38.6 months in OL-HDF group) at the start of the study which led to a difference in the baseline parameters.

Our research shows that Online HDF would be a better kind of renal replacement than hemodialysis since it contributes to higher haemoglobin levels, lower erythropoietin dosages, better middle molecule and phosphorus clearance, and improved nutritional parameters and lesser intradialytic complications. When implementing, it is important to remember that Online HDF is more expensive than HD.

CONCLUSION

Patients on OL- HDF were having better quality of life than patients on HD. Better solute clearance, anemia control, improved nutritional and CKD MBD parameters were seen in OL-HDF. Less complications during dialysis were seen with OL-HDF. Cardiovascular events, infection rates and hospitalization rates were similar in the two groups. Though a greater number of patients in HD group expired (55% in HD group and 25% in OL-HDF group), the difference in mortality rate between the HD group and OL-HDF group was not statistically significant.

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