



Physical Function and Balance assessment in patients undergoing Haemodialysis – A CROSS-SECTIONAL STUDY

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Abstract

Background-Haemodialysis is a process of extracorporeal removal of body's waste products and remove excess water from the body. Patients with end stage renal disease are characterised by low levels of physical activity and a continuous decline in physical function. Observational studies have revealed that physical inactivity is associated with increased mortality in these patients. Patients have a substantial and sustained decline in functional status, especially during the period before and after initiation of dialysis, in addition to a dramatically high mortality hence this study was undertaken with purpose to assess the physical function and balance in patients undergoing haemodialysis.

Method-There were 27 patients undergoing haemodialysis that were included in study. The time up and go test was used to assess the physical function and the berg balance scale in order to assess the balance

Result-The mean TUG score was 12.14 ± 3.163 which when compared to the normative values (8.9 to 9.2) shows increase in the TUG score which leads to slight decrease in functional capacity. The average BBS score or Low risk category is 54.65 and medium risk category is 40 which shows that majority of the subjects come under less risk of fall category. The p value is <0.0001 which is highly significant also the r value is -0.8692 which shows negative correlation among the BBS and the TUG scoring. Hence there is a negative correlation between the TUG and BBS components. Increase in the BBS shows intact balance and decrease in the TUG score shows intact functional capacity.

Conclusion-The study concludes that Physical function and Balance gets affected in Patients undergoing haemodialysis. Due to decreased muscle strength and overall reduction in physical fitness

Keywords-Haemodialysis, Balance assessment, Functional capacity assessment

1. Introduction

Haemodialysis is a process of purification of the blood of a person whose kidneys are not working. This process involves extracorporeal removal of body's waste products such as urea and creatine and removes excess water from the body. There is removal of water via ultrafiltration so it leaves the patient with nausea, fatigue, cramps, low blood pressure, and headache after the post therapy. Long-term complications include haemodialysis associated amyloidosis, neuropathy and other heart disease. Increasing frequency of the length of treatment has to improve the fluid overload and enlargement of heart is seen inpatients. Patients with end stage renal disease (ESRD) are characterised by low levels of physical activity and a continuous decline in physical function. Observational studies have revealed that physical inactivity is associated with increased mortality in these patients. Patients have a

substantial and sustained decline in functional status, especially during the period before and after initiation of dialysis, in addition to a dramatically high mortality.

Among the many reasons for low levels of physical activity in ESRD, three factors contribute most:

- (1) Reduced muscle strength caused by muscle catabolism and wasting,
 - (2) a substantially increased cardiovascular risk in combination with a high prevalence of comorbid disorders, both leading to a reduced health related quality of life (QoL), which is in itself part of a vicious cycle further impairing physical activity with
- Subsequently
- (3) Reduced physical fitness.[1]

Chronic kidney disease (CKD) affects 8–16% of the population worldwide and is associated with an increased risk of cardio-vascular disease (CVD), muscle wasting, decreased physical Function and overall poorer quality of life (QOL). Exercise is being increasingly recognized for its therapeutic benefits in patients with CKD, which include improved physical fitness, cardiovascular health and better QOL. Most of the research regarding such benefits has been conducted in dialysis patients but the potential of exercise to modulate a number of factors related to disease progression, as well as address co-morbidities, makes it a particularly interesting and theoretically important treatment for all patients with CKD. Current international guidelines recommend that CKD patients should engage in an exercise programme that is compatible with cardiovascular health for 30 min, 5 days of the week. Despite this, CKD patients are known to lead insufficiently active lifestyles. Identifying barriers and asking participants to strategize ways to overcome them is a popular technique used in behaviour change interventions. The barriers and motivators CKD patients have towards exercise participation, although these have been explored more extensively in other target populations.[3] Nearly all of these studies identified enjoyment as a motivator for exercise participation, an intrinsic motivator associated with sustained exercise behaviours.[3] Overall quality of life in patients with end-stage renal disease (ESRD) is low, and impairments in areas related to physical functioning are particularly prominent in keeping with low self-reported physical functioning, the aerobic exercise capacity of people treated with maintenance hemodialysis therapy is approximately half the expected value for sedentary healthy individuals. Cardiac disease, alterations in muscle function, metabolic abnormalities, and anemia have been implicated. Cardiac problems include diminished left ventricular functional reserve and increased arrhythmias. Muscle abnormalities include low activity of enzymes, loss of capillaries, fiber atrophy, loss of contractile proteins, and electromyographic denervations.[6]

2. Material and Methodology:

2.1 Research settings: DVVPPF's College of Physiotherapy Ahmednagar

2.2 Research design: cross-sectional study

2.3 Sampling method: Convenience sampling

2.4 Sample size: 27

2.5 Inclusion criteria:

Patients undergoing haemodialysis

Age group 18 years onwards

2.6 Exclusion criteria:

Patients with recent fractures, surgeries of lower limb

Any neurological condition,

Patients not willing to participate

2.7 Procedure:

Before beginning the test, the ethical clearance of the institutional committee was taken along with the consent of the patient.

For the functional mobility assessment, the timed up-and-go was used as an assessment of functional mobility. Subjects were asked to rise from a standard, armless, wooden chair to a full standing position, continue walk 10 m, turned around a marker and returned to the seated position, performing these manoeuvres as fast as possible. Returning to the chair and sitting stopped the clock. Five trials were given with 1 min rest between trials; the fastest time was accepted for the get-up-and-go score. Subjects were instructed to walk the measured course as fast as possible; the fastest of three trials was used as the final score for the walk test.

For the assessment of balance, the berg balance scale was used. the berg balance scale is used to objectively determine a patient's ability to safely balance during a series of predetermined tasks.it is a 14-item list with each item consisting of a five point ordinal scale ranging from zero to four with zero indicating the lowest score and 4 indicating the highest score. The components included are

1. Sitting to standing
2. Standing unsupported
3. Sitting unsupported
4. Standing to sitting
5. Transfer
6. Standing with eyes closed
7. Standing with feet together
8. Reaching forward with outstretched arms
9. Retrieving an object from floor
10. Turning to look behind
11. Turning 360degrees
12. Placing alternate foot on stool
13. Standing with one foot in front
14. Standing on one foot[18]

2.8 Outcome measures:

Time UP and Go test for functional assessment,

Berg balance scale for balance assessment

2.9 Material: Measuring tape, Stopwatch

3. Result:

TABLE 1: Baseline characteristics

GENDER	M	F	TOTAL
NUMBER	19	8	27
AGE	42.31	46.37	44±14
BMI	20.28	22.35	21±4.063
DD	16.52	11.81	15.13±14.71

The above table shows the baseline characteristics of the number, age , BMI and duration of dialysis. The total number of individuals involved in the study was 27 out of which 19 were males and 8 were females. The average age of the males was 42.31 whereas for the females was 8 ,the mean age for all the subjects was 44±14 . Where the average BMI for the males was 20.28 and that for the females was 22.35, the overall mean BMI for the subjects was 21±4.06. The average duration of dialysis for the males was 16.35 and that for the females was 11.81 , the average duration of dialysis for the sample were 15.13±14.71

TABLE 2: TUG and BBS divided as per age groups

AGE	TUG	BBS
18-22	9.8	56
23-27	15.23	55
28-32	10.08±0.96	55.66±0.74
33-37	12.66±1.47	55±0.81
38-42	13.58±5.91	52.8±6.4
43-47	0	0
48-52	13.06±0.41	52.66±0.47
53-57	11.62±0.51	56
58-62	13.39±0.06	52±3
63-67	14.21±2.08	53.33±2.35
68-72	11.51	53

The above table shows the division of the TUG and BBS average scores according to the age groups. The youngest subject age group ranging from 18-22 and the eldest ranging from 68-72. It was observed that the decrease in the performance in TUG value was observed in the age group of 63 – 67 years. The best score was observed in the age group of 18-22. Whereas the lowest score observed in the BBS was 52 which was observed in the age groups of 38-42,48-52 and 58-62.

TABLE 3: TUG and BBS as per the Duration of Dialysis :

DD	TUG	BBS
0-10	12.58±2.02	54.1±1.81
11-20M	12.04±4.31	54.27±4.59
21-30	12.7±1.49	53±2.94
31-40	15.23	55
41-50	9.8	56
51-60	0	0
61-70	0	0
71-80	13.34	53

The above table shows the TUG and BBS scoring as per the subjects duration of dialysis. The categories divided from 0-10 months to 71-80 months categories. In the study most of the individuals 0 to 30 months of duration dialysis. The highest value obtained was 15.23 in the 31 to 40 months category and the lowest average of 9.8 ranging from 41-50 months category. The table shows the overall increase in the TUG score as the duration of dialysis increases.

Table 4: TUG and its normal values

Age	Normal values	Observed value	Difference
20-29	8.57	11.73	3.16
30-39	8.56	12.39	3.83
40-49	8.87	11.55	2.68
50-59	9.9	12.50	2.6
60-69	8.1	13.98	5.88
70-79	9.2	11.51	2.31

The above table shows the normal values and the observed values of the TUG scoring according the age group from 20-29 years to 70-79. On comparison there is seen an increase in the time up and go test values which increases decrease in the functional capacity, with the mean difference of 3.41 seconds

With the highest difference of 5.88 seconds in the age group of 60-69 years.

Table 5: BBS and its normal values

Normal values	Subjects	Average BBS Score
0 -20 (High risk of falls)	0	0
21-40 (medium risk of falls)	1	40
41-56 (Low risk of falls)	26	54.65

The above table shows the berg balance scale with the normal values. it is used to determine the balance score of the individual . Out of 27 patients 26 were categorised into low risk fall and one in the medium risk fall category. The average BBS score or Low risk category is 54.65 and medium risk category is 40.

Table 6: Result

TUG	BB	R value	P value	Result
12.14± 3.163	54.11±3.337	-0.8692	<0.0001	extremely significant

As discussed in the above tables the mean TUG score was 12.14±3.163 which when compared to the normative values (8.9 to 9.2) shows increase in the TUG score which leads to slight decrease in functional capacity. The average BBS score or Low risk category is 54.65 and medium risk category is 40 which shows that there is less risk of fall. The p value is <0.0001 which is highly significant also the r value is -0.8692 which shows negative correlation among the BBS and the TUG scoring. Hence there is a negative correlation between the TUG and BBS components. Increase in the BBS shows intact balance and decrease in the TUG score shows intact functional capacity.

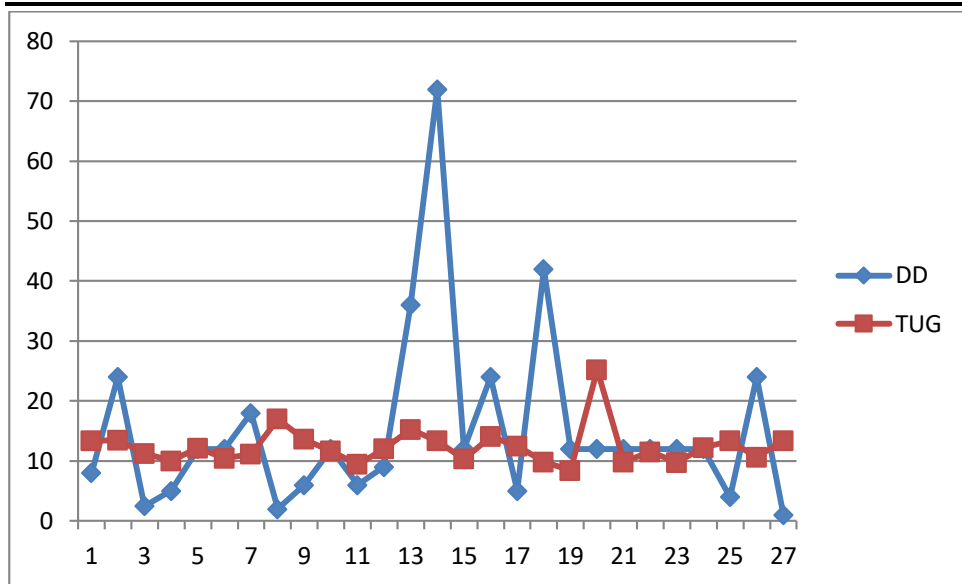


Fig no 1: The above table shows correlation between the Duration of Dialysis and Time Up and go test values. The correlation between the DD and TUG is not significant. The X axis shows the TUG values in seconds and the Y axis shows the Duration in months

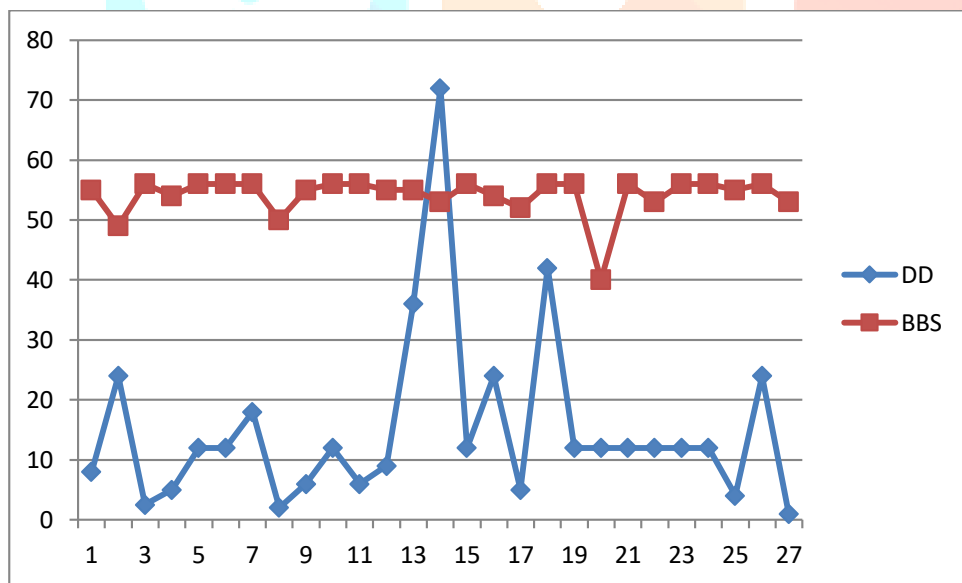


Figure 2: The above figure shows the correlation between the duration of dialysis and the Berg Balance Scores the outcome of the correlation is not significant. The X axis shows the duration of dialysis in months and the Y axis shows the berg balance score.

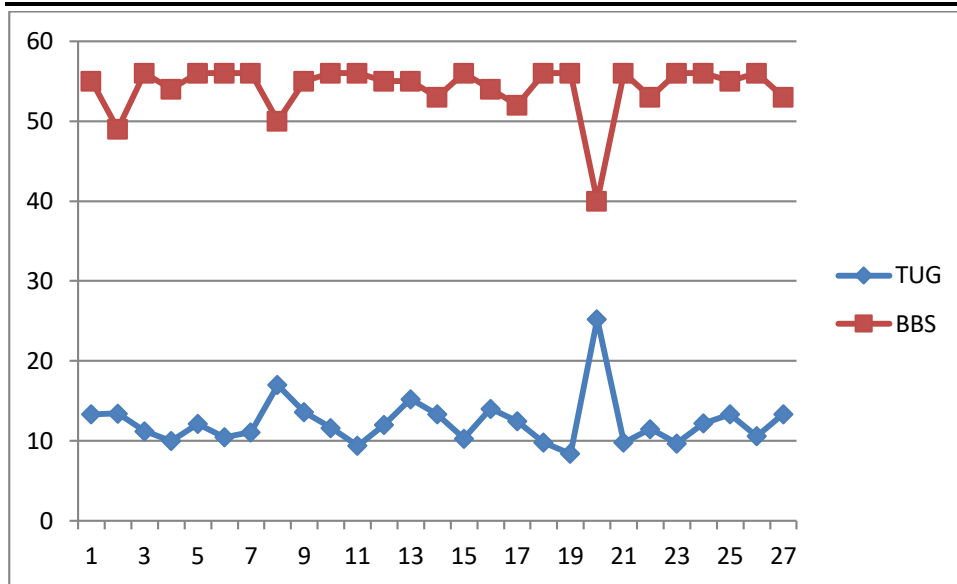


Fig 3: The above figure shows the correlation between the TUG scores and the BBS scores. The correlation between the two is highly significant which shows that with the decrease in the berg balance score and decrease in the TUG test are inversely proportional and vice versa.

The X axis shows the TUG values in seconds and then the Y axis shows the BBS values.

4. Discussion:

The objective of the study was to assess the balance and functional capacity of patients undergoing haemodialysis. The TUG test was performed with a distance of 3 meters, the best score was used to calculate the result. The data showed that there was an increase in the TUG scores varying according to their age groups. This shows that there is a slight deterioration in the physical function of the patients undergoing haemodialysis hence the TUG score was affected as many MHD patients are profoundly deconditioned and exhibit significant muscle weakness, also malaise and intolerance of virtually any form of exercise apart from self-care is troublesome. Studies of exercise capacity and training in MHD patients frequently report low exercise tolerance. Indeed, many studies indicate that MHD patients are profoundly deconditioned and often weak. The cause of weakness is not entirely understood, but muscle atrophy, myopathy, malnutrition and carnitine deficiency have been proposed as contributors.

Similar study done by Johansen et al demonstrated that dialysis patients have significantly greater contractile area atrophy compared with healthy controls, even when corrected for habitual activity level. They further demonstrated that this atrophy was proportional to muscle weakness and reduced physical performance as determined by gait speed. These authors point out that the weakness resulting from muscle atrophy is an important cause of reduced physical function and that greater emphasis should be placed on strategies to increase muscle mass and strength in this population. In the erythropoietin era where target haemoglobin levels are 11–12g/dl, MHD patients still suffer not only from substantially reduced endurance performance, but also from a marked decrease in muscle function and the ability to carry out routine physical activities; because of their profound muscular weakness, endurance exercise training in MHD patients provides an adequate stimulus not only to improve cardiopulmonary fitness, but also muscle strength, power and fatigability as well physical performance; and endurance training leads to rapid increases in the amount of work that could be tolerated during exercise training.[14]

The BBS scale was used to assess the overall balance of the patients undergoing the haemodialysis. The 14 components of the berg balance scale were assessed in order to conclude the overall balance of the individuals the study found out that the subjects had low risk of fall as the average BBS scoring was somewhere around 54 out of 56. The study showed there was a reduced performance of the TUG test when compared with the normative values. Also there was a slight reduction in the BBS score due to the deterioration of the balance due to sedentary lifestyle and low physical activity. Barriers to exercise were poor health, fear of injury or aggravating their condition, a lack of guidance from healthcare professionals and a lack of facilities.

5. Conclusion:

The study concludes that Physical function and balance gets affected in Patients undergoing haemodialysis. Also when the TUG score was reducing the balance was also getting affected due to decreased muscle strength and overall reduction in physical fitness.

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