

# **Efficacy of Intradialytic Range of Motion Exercise Training on Reducing Physical, Bio –Physiological and Psychological Complications Among Hemodialysis Patients-Meta Analysis**

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## **Introduction**

Chronic Kidney disease (CKD ) is a major health issue Globally with a significant increase of its socio –economic burden anticipated in the studies and renal therapy registries in the year 2010, more than 2.6 million people were receiving renal replacement therapy (RRT ) Worldwide.<sup>1</sup>

10 % of the population worldwide is affected by CKD, and Millions die each year because they did not have access to affordable treatment<sup>2</sup>.

According to 2010 Global burden of Kidney disease study, Chronic Kidney disease was ranked 27<sup>th</sup> in the list of cause of total number of deaths Worldwide in 1990, but it rose to 18<sup>th</sup> in 2010. This degree of movement up the list was second only to that for HIV & AIDS<sup>3</sup>.

Over 2 Million people Worldwide currently receive treatment with dialysis or a Kidney Transplant to stay alive, yet this number may not only represent 10 % of the people who actually need treatment to live<sup>4</sup>. Of the 2million people who receive treatment for kidney failure the majority are treated in only five countries –The United States, Japan, Germany, Brazil and Italy. These five countries represent only 12 % of the World population; only 20% are treated in about 100 developing countries that make up over 50 % of the World population<sup>4</sup>.

Patient diagnosed with chronic Kidney disease (CKD) require a nephrological monitoring of their kidney function and a therapy that reflects a patient diagnosis and prognosis <sup>1</sup>. 88.2% of all incident cases of ESRD involved renal replacement therapy with Haemodialysis ,ESRD is highly prevalent in developing countries, Patients generally receive haemodialysis 3 days /week and each session generally takes 4 hour.Begining dialysis induces multiple physical and psychological stressors in patients , fatigue is another critical concern caused by haemodialysis , ESRD patients receiving haemodialysis have reduced red blood cells production because of less Erythropoietin production causes fatigue, Prevalence ranges from 53 % - 97 % depression is the another most Psychosocial problem observed in ESRD<sup>5</sup>.

Haemodialysis' (HD ) Patients spend an average of 12 hour weekly being sedentary on dialysis ,thus it is a good opportunity to integrate Intra Dialytic Exercise (IDE ), it might not be a miraculous cure

,but it could surely add more functionally to the time spent in HD,improve patient QoL (Quality of Life ), decrease anxiety, may be adherent to the treatment, perhaps , IDE could be coupled with music ,since music therapy in HD patients has shown it can reduce anxiety ,pain ,nausea while it improves BP ,Quality of sleep ,fever, cramps ,anxiety ,depression and pain<sup>7</sup>.

The Study aimed to investigate the efficacy of intradialytic Exercise (IDE) during haemodialysis in improving the physical parameters, Renal function index, Bio chemical markers and quality of life .Also in specific consideration it improves Hb, reduces urea Cr, BUN and improves muscle strength.

## **Methods**

### **Eligibility Criteria**

#### **Inclusion Creiteria**

- Chronic adult HD patients
- Willing & ability participate in the Intra Dialytic Exercise Program (IDE )( ROM,Aerobic Exercise, Resistance Training )
- Over 30 yrs of age
- Diagnosed CKD -5 and treated by HD at least > 3months

#### **Exclusion Criteria**

- Lower extremity amputation
- Non IDE exercise as a Intervention
- Severe Dementia / retardation
- Complications other hindering the IDE Programme.

## **Outcomes**

### **Primary outcome**

- Bio Physiological outcome (sr.Urea, Creatinine, BUN, Hb, k+, ca, Phosphorous,)
- b)-Physical variable –Muscle strength,BP,Weight

### **Secondary outcome**

- Psycho Social variable (Anxiety, Depression, QoL)

## **Search Strategy**

Potential studies were identified from Pubmed, Medline, Embase (Ovid) and Cochrane database from 2015 to 2019 studies based on the selected inclusion criteria as well as the intervention during the dialysis treatment (IDE) and the research Design.

## **Study Design**

The Searched studies were scrutinized for RCT, Experimental design, Clinical trials and SPIRTC (Standard protocol items for randomized interventional trails)

## **Sampling Techniques**

The Sampling technique used for this study was probability sampling type with Randomized control and cluster

## **Interventions**

- The Experimental interventional group performed in the form of 3 sessions of 30 Minutes /week for 12 weeks -one group,24 weeks another group , 32 weeks another group by using cluster.
- ID Range of motion exercise 30 minutes /session/3 weeks- for 8 weeks
- Intra dialytic Resistance exercise /Aerobic exercise program.

## **Data Collection**

There are five data collection points in this Meta analysis.

- Base line demographic profile
- Bio Chemical Characteristics
- Physiological parameters
- Clinical examination
- Psychosocial assessment

## **Data Collection Procedure**

Demographic profile were collected from interview method ,Physiological parameters such as BP and weight checked by a standard and calibrated digital scale and parameters .Bio chemical markers are collected from the blood samples and checked such as blood urea, sr.Creatinine,Sr.K+, Sr.Calcium and phosphorous ,BUN and Hb.Psychosocial assessment was done by using Beck Depression inventory for depression, Quality of life Index Living questionnaire of Minnesota to assess the Quality of life also personality parameters was evaluated at beginning and end of the study.

## **Data Management and Statistical Analysis**

Tables and figures containing Mean, Median, Mode, SD and minimum and maximum values.

For the comparison of variables between 3 or more groups two way ANOVA and MANOVA. Pearson Chi –squared test will be utilized for statistical analysis of the categorical Variables <sup>1</sup>.

This evidence of possible effects related to the experimental and control condition will be conducted by estimated values and 95% confidence intervals<sup>1</sup>.

All tests will be 2 tailed with statistical significance set at an alpha level of 0.05.

## Results

The Total participants were randomized and the results shows baseline Mean, SD, Minimum and Maximum values, Median and interquartile range where applicable and percentage of the outcome measures. Baseline data

### Baseline Measurements

S.No	Outcome Measures	Mean	SD	Minimum	Maximum	Missing
1.	30-s STS	9.79	5.11	0	23	16(9.4 )
2.	8-Foot TUG	9.67	3.92	0	24.7	11(7.3)
3.	Weight	76.11	18.42	45.6	141	1(0.6)
4.	Phosphorous	1.57	0.42	0.67	2.89	1(0.6)
5.	Urea reduction ratio	76.28	5.54	58.5	89	2(1.2)
6.	Albumin	35.15	4.01	20	46	1(0.6)
7.	Mean arterial pressure	64.45	13.64	64.3	129.3	1(0.6)
8.	FSST	15.04	6.99	7	62	17(12)
9.	DEA	0.83	2.35	0	22	2(1.2)

FSST-Four square step test, DEA-Dialysis exercise adequacy

The above table depict the evidence for the assessing the variable for 30s –STS, 8-Foot TUG,Weight,Phosphorous,Urea reduction ratio, Albumin, Mean Arterial Pressure,FSST &DEA,These variables evidenced that the marked statistical improvements in reducing after the Intradialytic Exercise.

### Quality of Life

Fv QoL index was used to measure QoL among dialysis patients; QoL Index was only measured at baseline immediately before the intervention and at the completion of the intervention<sup>6</sup>.

### IDE Effects of QoL

A Total of 17 studies showed the effect of aerobic IDE in QoL Data very heterogeneous due to the use of difference QoL Instruments, Accordingly, Meta analysis including all studies could not be conducted <sup>7</sup>.

TABLE 1 No. Of Experimental participants involved in any of the IDE TRAINING PROGRAMME

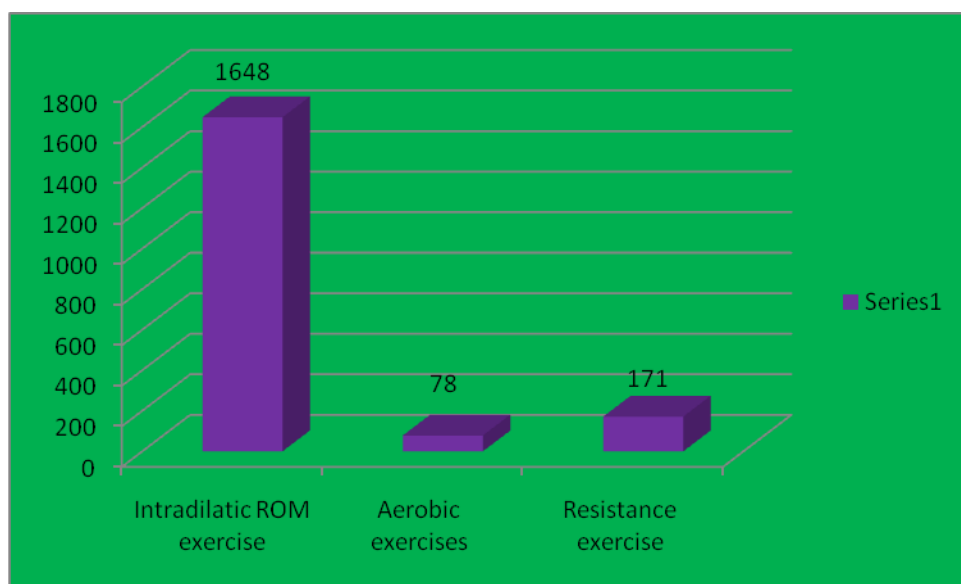


Table 1 depicts that no. Of participants involved in any of the Intra Dialytic Exercise Programme, among 1897 participants 1648 of them involved in Intradialytic ROM Exercise, 171 of the underwent Resistance exercise training and 78 of them are exposed to Aerobic Exercise.

TABLE 2: No. Of weeks participants involved in any of the IDE TRAINING PROGRAMME

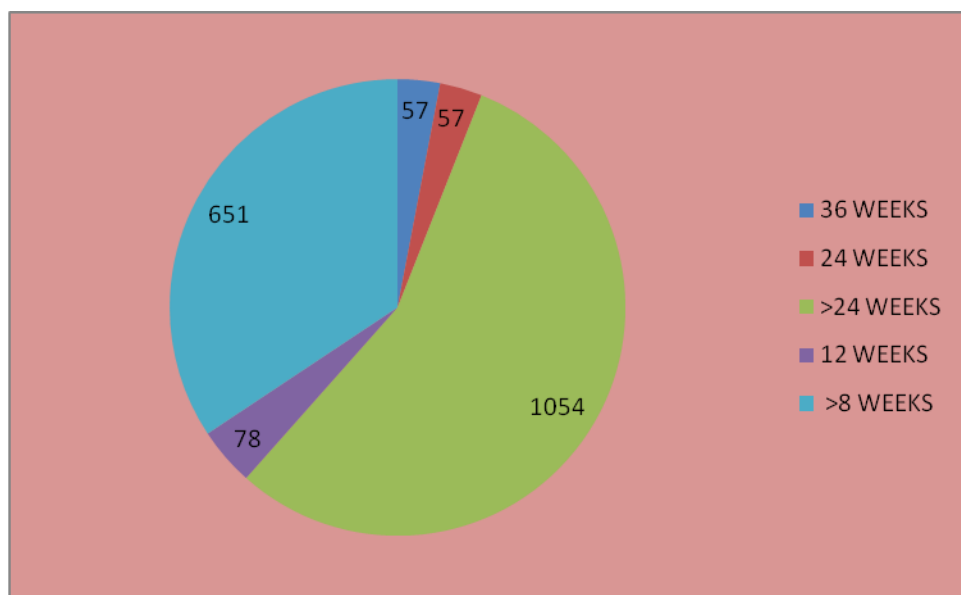


Table 2 evidence for the no. Of participants involved in any of the Intra Dialytic Exercise Programme with the duration , among 1897 ,majority of them 1054 participants involved in >24 weeks exercise programme, 651 of them exposed to >8 weeks ,78 of them were 12 weeks , 57 of them were exposed to 36 & 24 weeks.

### Efficacy of Intradialytic Exercise on Physical and Pshyco Social Effects

This table give clear explanation about the experimental participants involved in any one of the intradialytic exercise programme

24 studies from 997 patients were included for more than 24 weeks intradialytic exercise training on the efficacy as follows; it significantly improves peak oxygen consumption and physical performance

S.no	Parameters	Smd	Maximum Value	Ci(Confidence Interval )
1	Kt/V	0.27	95%	0.01 – 0.53
2	Physical performance	0.30	95%	0.04 – 0.55
3	O <sub>2</sub> consumption	0.53	95%	0.30 – 0.76

17 studies from 651 patients were included for more than 8 weeks intradialytic exercise training on the efficacy as follows, it significantly improves peak oxygen consumption and physical performance ect...

S.no	Parameters	Smd	Maximum Value	Ci(Confidence Interval )
1	Hb	0.34	95%	0.13 – 0.55
2	O <sub>2</sub> consumption	0.50	95%	0.26 – 0.74
3	Depression	0.80	95%	-1.10 – -0.50
	QoL	0.46	95%	0.20-0.73

Participants from 41 studies of which 1649 experimental groups were selected to administer the intradialytic exercise to improve the Physical and psychosocial complications such as their Hb values, peak O<sub>2</sub>consumption, depression and quality of life. The statistical values in markedly evidencing that significant difference in SMD, MAXIMUM VALUE AND THE CONFIDENCE INTERVAL values has been give clear picture about the efficacy of intradialytic Exercises.

### Discussion

RCT Administration on physical functioning decline during non-exercise and improvement associated with resistance exercise. All the groups decline was seen over the periods of 3,6 and 9 months where no exercise was being performed, Both Physical function and muscle strength typically

provides a measure of peak muscle force<sup>1</sup>.

- Study involved an intradialytic exercise program rather than exercise before, after or on a non-dialysis day. Although limitations include being seated and having needles in situ, exercise during the
- Meta-analysis of 5 articles showed that aerobic IDE improves both QoL –PCS, and QoL-MCS. This is partly in line with findings reported in the literature where the Meta-analysis of studies on aerobic and resistance IDE Programmes showed that IDE had a significant difference on the QoL-PCS. Out of 3 RCTs focusing on Sr. Phosphorous two of them had an increase in P in their control group, thus they postulate that the IDE Programme reversed the natural deterioration of Sr.P commonly seen among HD Patients, this gives more importance to the positive clinical effect of IDE<sup>7</sup>.
- When comparing the 5 RCTs, characterized by similar duration of exercise per dialysis session and intensity, the most prolonged exercise programme resulted in the most significant change<sup>7</sup>.
- Based on the recent experience and research literature resources beneficial effects following the Physical activity programme during HD the significant will be proved by , improvements in lower extremity muscle function<sup>1</sup>.
- The study found that there is a significant reduction in systolic BP after administration of Intradialytic exercise in the experimental group.
- In relation to bio chemical markers in the present study Creatinine, urea, BUN, Potassium, calcium, Phosphorous and Hb level were compared between experimental group and control group found that among patients in the experimental group. There was a significant improvement in the level of blood Urea, calcium, phosphorous, potassium.

Participants from 41 studies of which 1649 experimental groups were selected to administer the intradialytic exercise to improve the Physical and psychosocial complications such as their Hb values, peak O<sub>2</sub> consumption, depression and quality of life. The statistical values markedly evidencing that significant difference in SMD, MAXIMUM VALUE AND THE CONFIDENCE INTERVAL values has been given a clear picture about the efficacy of intradialytic Exercises.

This Meta-analytical study results facilitate selecting intradialytic exercise provides safety and benefits with the respect to Physiological complications of which BP, Muscle Strength and weight. Bio Physiological Complications such as Serum Urea, Creatinine, potassium, calcium Phosphorous and Hb also it has effects in Psychosocial well being of depression, anxiety and improves the Quality of Life. Patients who are undergoing Haemodialysis can opt for any of the exercise programme; it may be minimizing their Intradialytic complications during and after.

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