

RESEARCH ARTICLE

ROLE OF PHYSIOTHERAPY IN IMPROVING QUALITY OF LIFE IN LIVER TRANSPLANT PATIENTS

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ABSTRACT

Objective: To evaluate the impact of pre and early post operative physical therapy on quality of life (QOL) in patients of liver transplantation. **Methods and materials:** A Single group pre and post experimental study design was conducted in Shifa International Hospital in which 20 patients with cirrhotic liver waiting for transplant participated. Non probability Convenience Sampling technique was used. Data was collected over a period of six months using a standard questionnaire 36-Item Short Form Survey (SF-36) and a General demographic questionnaire which included age, gender, BMI, along with diabetes, hypertension, ECOG level, tidal volume, muscle power, 6 minute walk test (heart rate, SpO₂, distance covered, exertion level measurement). **Results:** The mean \pm SD age & Body Mass Index of the participants (N=20) were 47.20 ± 11.49 years and 24.83 ± 2.1 respectively. 6 Minute Walk Test Heart Rate, 6 Minute Walk Test Distance, , ECOG, 6 Minute Walk Test Exertion Level and Muscle power were shown significantly improved throughout the treatment duration ($p < 0.001$). While 6 Minute Walk Test Oxygen Saturation showed significant improvement only in initial two weeks ($p = 0.01$), but at the end of 2nd week and overall improvement was not significant ($p \geq 0.05$). The results of the study also showed significant improvement ($p < 0.001$) in all domains of quality of life (SF-36) at the end of study. **Conclusion:** The study indicated that early pre and post physiotherapy interventions can improve the overall health-related quality of life including the aerobic physical fitness and muscle strength in patients having liver transplantation

Keywords: 6 minute walk test, ECOG, Incentive spirometry, Liver transplantation, Muscle power, Physiotherapy, Quality of life.

INTRODUCTION

Liver transplant has emerged as one of the viable treatment in past decade. Systemic complication of chronic liver disease results from cardiopulmonary disease, Active alcohol and drug use, Malignancy outside liver, advanced age and AIDS.¹

For the improvement in liver function and increasing the survival of patients who are suffering from end-stage or acute liver failure, the definite surgical treatment is the 'liver transplantation'.²

The health-related quality of life has been acknowledged with the surgical success in the recent years, and has become an important assessment parameter after the transplantation as well as during the disease process.³ The physical activity level is usually reduced due to low physical performance status among liver transplant patient even before or after transplantation that over all compromises quality of life. But the limitation is multifactorial and depends on post transplantation duration and stage of disease.^{4,5}

There are three phase of physical therapy intervention for liver transplant patient including preoperative, early postoperative and late

postoperative phase. Every phase has its own known indication and contraindication for physical therapy intervention.⁶ Assessments such as muscle strength & endurance are included in Physiotherapeutic evaluation along with assessment of aerobic capacity levels, independence in daily life activities, physical activity levels and quality of life. Further, investigation of pain, fatigue, alcohol & smoking habits and musculoskeletal, neurological or metabolic comorbidities are observed in assessment procedures. To overcome the post-operative deconditioning and complication due to physical inactivity, the patient can be assisted with the starting of physiotherapeutic interventions before the patient's transplantation.^{6,7}

Reduced muscle strength, aerobic capacity and quality of life is also considered in patients with liver disease in relation to their stage of disease. A decreased aerobic capacity was displayed which was measured by the maximal cardiopulmonary exercise testing, in about 2/3rd of cirrhotic, who were not suffering from cardiopulmonary disease or having any other confounding factors.⁷

As in Pakistan liver transplantation was started in recent years, and physical therapy was considered as integral part of management in liver transplant, to avoid complication and improve quality of life. There is lack of evidence regarding role of physical therapy in liver transplant patients in Pakistan. The current was conducted to evaluate the impact of pre and early post-operative physical therapy on quality of life in liver transplant patients in Pakistan.

MATERIAL & METHODS

A Single group pre and post experimental study design was conducted in Shifa International Hospital after the ethical approval of institutional review board and ethics committee (IRB#665-113-2016). Non probability Convenience Sampling technique was used for sample collection. A total of n=20 patients with cirrhotic liver waiting for transplant were included in the study. Physical therapy was performed pre and post liver transplant with an aim to improve the aerobic physical fitness along with the quality of life including an improvement in the

muscle strength in liver transplantation patients. (Table 1).

Data was collected over a period of six months using a standard questionnaire 36-Item Short Form Survey (SF-36) and a General demographic questionnaire which included age, gender, BMI, along with diabetes, hypertension, ECOG level, tidal volume, muscle power, 6 minute walk test (heart rate, SpO₂, distance covered, exertion level measurement). Questionnaire was administered to all the patients with prior informed consent at zero week, second week and fourth week for the measurement of aerobic physical fitness level and muscle strength while quality of life was measured at zero week and at the end of fourth week. The data was analyzed by SPSS IBM 21. Categorical variables were presented as frequency, whereas continuous variables were presented as Mean \pm S.D. Data was found normally distributed through Sphiro-wilk test, so repeated measure analysis of variance (RM-ANOVA) was used to analyze data.

Table 1 : Physical Therapy Protocol For Liver Transplant Patients

Pre-operative PT					
Intervention	Area/muscles/activity	Intensity	Frequency/Session	Sets/day	Duration/session
Spirometry	Chest/ Inspiratory muscles	2000-3000 ml	10 reps	One hourly	05 minutes
ACBTS	Chest/ intercostal muscles and diaphragm	Deep breathing with full chest excursion	20 reps	BID	05 minutes
Huffing & Cuffing	Chest/ expiratory muscles	Moderate to full expiratory force	10 reps	BID	05 minutes
Percussion	Chest	Clapping with Moderate force	50 reps	BID	05 minutes
Limb physio	AAROM of all four limbs	Full range movement of all major joints of both upper and lower limbs	20 reps	TID	10 minutes
Post-operative PT					
Spirometry	Chest/ Inspiratory muscles	Starting with 1000 ml and then progressing to 3000 ml within a week	10 reps	One hourly	05 minutes
ACBTS	Chest/ intercostal muscles and diaphragm	Deep breathing with full chest excursion	20 reps	TID	05 minutes
Huffing & Cuffing	Chest/ expiratory muscles	Moderate to full expiratory force	10 reps	TID	05 minutes
Percussion	Chest	Clapping starting gently then with Moderate force	50 reps	TID	05 minutes
Limb physio	AAROM of all four LIMBS. Gradually leading to strengthen exercises.	Full range movement of all major joints of both upper and lower limbs. Out of bed activity	20 reps	TID	10 minutes

RESULTS

The mean ± SD age & Body Mass Index of the participants (N=20) were 47.20 ± 11.49 years and 24.83 ± 2.1 respectively. The details of other categorical variable were shown in figure1.

6 Minute Walk Test Heart Rate, 6 Minute Walk Test Distance, ECOG, 6 Minute Walk Test Exertion Level, and Muscle power were shown significantly improved throughout the treatment duration ($p < 0.001$). While 6 Minute Walk Test Oxygen Saturation showed significant improvement only in initial two weeks ($p = 0.01$). But at the end of 2nd week and overall improvement was not significant ($p \geq 0.05$). (Table 2) The results of the study also showed significant improvement ($p < 0.001$) in all domains of quality of life (SF-36) at the end of study. (Table 3)

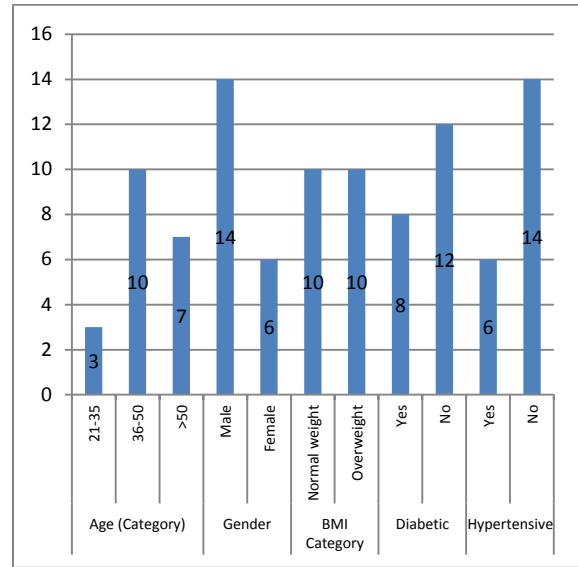


Figure 1: Demographics of study participants

Table 2: Within group changes

		Mean	SD.	p-value
6 Minute Walk Test-Heart Rate	0 week	103.37	11.08	<0.001 ^a
	2 nd week	93.28	6.50	<0.001 ^b
	4 th week	85.50	5.01	<0.001 ^c
6 Minute Walk Test-SpO ₂	0 week	91.80	2.99	0.01 ^a
	2 nd week	93.87	.91	1.00 ^b
	4 th week	94.12	3.68	0.09 ^c
6 Minute Walk Test-Distance	0 week	180	58.11	<0.001 ^a
	2 nd week	225	36.71	<0.001 ^b
	4 th week	274	43.79	<0.001 ^c
6 Minute Walk Test-Exertion Level	0 week	3.85	1.49	<0.001 ^a
	2 nd week	2.85	0.67	<0.001 ^b
	4 th week	1.40	0.75	<0.001 ^c
ECOG Performance Status	0 week	2.45	.887	<0.001 ^a
	2 nd week	1.45	.759	<0.001 ^b
	4 th week	.45	.759	<0.001 ^c
Tidal Volume (ml)	0 week	777.50	213.04	0.07 ^a
	2 nd week	2230.00	419.39	<0.001 ^b
	4 th week	3525.00	462.11	<0.001 ^c
Muscle power	0 week	2.85	.48	<0.001 ^a
	2 nd week	3.75	.55	<0.001 ^b
	4 th week	4.75	.44	<0.001 ^c

^a0Week vs 2nd week^a, ^b2nd week vs 4th week^b, ^c0Week vs 4th week^c

Table 3: Quality of life in Liver Transplant Patient

		Mean	SD	p-value
Physical Function	Pre	49.62	19.40	<0.001*
	Post	88.75	8.56	
Role limitation – Physical	Pre	5	10.25	<0.001*
	Post	38.75	18.97	
Role limitation – Mental	Pre	0	2.56	<0.001*
	Post	43.3333	19.22	
Social Function	Pre	33.125	7.78	<0.001*
	Post	76.25	19.35	
Pain	Pre	44	15.96	<0.001*
	Post	75.5	11.76	
Mental Health	Pre	39.75	5.72	<0.001*
	Post	65.5	12.23	
Energy / Vitality	Pre	42.75	12.29	<0.001*
	Post	70.75	6.93	
General Health	Pre	21.5625	4.28	<0.001*
	Post	61.875	8.33	
Health Change (In 1 year)	Pre	11.25	12.76	<0.001*
	Post	82.50	11.75	

Level of significance <0.001*

DISCUSSION

The objective of the current study was to evaluate the impact of pre and early post-operative physical therapy on quality of life (QOL) in patients going through liver transplantation. The results showed overall significant improvements in all domains of QOL (SF-36).

The current study showed that 6 Minute Walk Test Heart Rate, 6 Minute Walk Test Distance, ECOG, 6 Minute Walk Test Exertion Level, and Muscle power was significantly improved throughout the treatment duration. In a retrospective study, there was achievement of significant functional gains by 55 liver transplant recipients after acute inpatient rehabilitation. Significant improvements were reported in various measurements such as aerobic capacity, physical performance and muscle strength, as a result of the rehabilitation process.⁷

The complaints of muscle pain, joint pain along with distress, incision pain & fatigue are commonly reported by those who have been undergone transplant, either during exercises or after exercises.³ Some of the common hindrances in achieving a high QOL in liver transplant patients includes the fatigue levels, reduced physical activity, inability to work, and compromised psychological health.⁶ Several studies suggested that, patients who are waiting for liver transplantation, specific

exercises and rehabilitation programs are necessary and helpful in increasing their muscle strength, endurance, aerobic fitness, functional independence the daily life and health-related QOL.^{7,8,9}

In current study significant improvement was shown in the physical functioning domain after physical therapy in liver transplant patients. The level of physical activity is mostly limited and decreased due to the less physical performance in liver transplant patients both before and after the surgery. This limitation depends on the severity and stage of condition and post-transplant duration. In chronic diseases, research has shown that high level of quality of life is significantly improved with increased physical activity.¹⁰ Athletes who are competing in transplant game showed significant improvement in post-transplant fitness. If pre & early physical therapy interventions are taken then QOL can be improved in patients within a month.^{5,9-12}

The current study showed that there was significant improvement in the Energy / Vitality domain of Sf-36. It was reported by a study that 44% patients, complained about severe fatigue, up to more than a decade after the transplant which was causing distress in the 1st year following their transplant.⁵ Further, a study also suggested that the fatigue experienced by those patients have liver transplant were attributed to the physical factors as those opposed to psychological factors.¹³

In the current study aerobic fitness was improved in the patients at 4th week of their physiotherapy treatment which ultimately improves the health related quality of life. If early physical therapy interventions are carried out in these patients then the level of severity can be reduced by improving the muscle strength.¹⁴

Long time immobilization in ICU can cause muscle atrophy, reduced lung expansion and diminished bronchial drainage. While Physiotherapy of the ICU patients reduces the complications which are cause due to immobilization. It can also further provide the respiratory support to prevent post-operative pulmonary complications while also restoring the functional independency.¹⁵ Early pulmonary physiotherapy should be started once patient comes in ICU and should continue till his discharge. In current study patients showed significant increase in their respiratory capacity in 4 weeks indicated by improvement in tidal volume. Pulmonary physical therapy includes breathing exercises, postural drainage, and incentive spirometry etc. Incentive spirometry can help to improve the lung capacity and strengthen the respiratory muscles.^{16,17, 18}

CONCLUSION

The early pre and post physiotherapy interventions can improve the levels of aerobic physical fitness along with the muscle strength and health-related quality of life in patients of liver transplantation. While the main limitations of the study such as small sample size with no comparison group and single centered study, compromises the generalizability of study. Along with these factors gender base differences like physical, psychosocial or cultural may be included in future studies as these factors affects the aerobic physical fitness levels, along with muscle strength and health-related quality of life levels in normal population.

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