

Impact of a Designed Nursing Intervention Protocol about Preoperative Liver transplantation Care on Patients' Outcomes at A University Hospital in Egypt

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Abstract

Background: Literature review cited that, Liver transplantation is now considered as the gold standard for treatment of patients with end-stage liver diseases and early liver tumors in cirrhotic livers. Patient education is vital to the safety and success of a transplant. **Aim:** the aim is to assess the impact of a designed nursing intervention protocol about preoperative liver transplantation care on patient's outcomes as indicated by: patients' knowledge & practice mean scores, and complications developed. To fulfill the aim of this study, the following hypothesis was formulated: patients undergoing liver transplantation who will be exposed to the designed nursing intervention protocol about preoperative liver transplantation care will show better outcomes.

Material and Methods: A convenient sample of 14 adult male and female patients admitted to Liver Transplant Unit at El Manial University Hospital were included, three of them were died with an attrition rate of 21.4%. Four tools were formulated to collect data pertinent to the study. 1- Sociodemographic and medical data sheet; 2- Pre/Post knowledge assessment questionnaire sheet, 3- Observational checklists, & 4- Complications assessment sheet. Structured interview, reviewing medical records, direct observation and physical examination were utilized for data collection. **Results:** a significant statistical difference was found in relation to the total and subtotal mean knowledge and practice scores during different assessment periods with P values (0.00 for both); as well, 45.5 % of patients developed respiratory complications (pleural effusion) compared to 53.8 % of their correspondence who developed respiratory complications (pleural effusion, chest infection, and others), in addition, 9.1% of the studied subjects developed rejection, and ascites as compared to (1.9 %, 5.7%) of their correspondence over the last consecutive three years respectively. **Conclusion:** Liver transplantation patients showed a positive improvement in their knowledge and practice in relation to breathing, coughing, & using respirometer exercises and range of motion. Replication of this study on a larger sample selected from different geographical areas is highly recommended.

Keywords: liver transplantation, designed nursing intervention protocol, preoperative liver transplantation care, knowledge, complications, and patient's outcome.

1. Introduction:

Liver transplantation (LT) represents the only chance of cure and long-term survival as a treatment of irreversible liver diseases and acute liver failure. The rates of success and survival have increased from 30% in the 1970s to almost 80% today (Masala, et.al. 2012). In less than 30 years, it has been rapidly developed from a highly experimental and controversial procedure to one of the most successful stories in medicine. It represents a complex surgical procedure, which require removal of a diseased or injured liver and replace it with a healthy whole liver or a segment of a liver from another person, called a donor (Lai, et.al. 2010, United Network, 2010, & Lesurtel, & Clavien, 2011).

The outcomes after LT have shown consistent improvement in the recent years. One-year patient and graft survival rates are 89.4% and 86.4%, respectively with cadaveric donor, and slightly higher at 91% and 86.8% with live donor (Scientific Registry of Transplant Recipients, 2012, and Schiff, Maddrey, & Sorrell, 2012). The major reasons for this dramatic increase include refined surgical and preservation techniques, better immunosuppressive protocols, more effective treatment of infections, and improved care during the critical perioperative period (Humar, Matas, & Payne, 2009, & Dienstag, & Cosimi, 2012).

Liver transplantation surgery is major in patients at risk and often causes more stress, anxiety, & complications than conventional surgery. The common complications are encountered in the early postoperative period can be technical, medical, or immunological in nature. These complications are death from bleeding during or immediately after transplant, non functioning graft, blockage of the artery or vein supplying the liver, bile duct leak or stricture, infections (bacterial, viral, & fungal), rejection, pleural effusion, recurrent ascites,

neuro-psychiatric problems, pressure sores, recurrent viral hepatitis, hernia, scar and other minor complications related to major surgery could be expected (Rajasekar, 2007, Navas, et al., 2010; & Brunicardi, et al. 2011).

Fullwood, Jones, & Lau-Walker, (2011); Cotler, (2011) and Sigh & Watt, (2012) mentioned that, the recognition, management, and prevention of medical as well as surgical complications and comorbidities after liver transplant is the key to improve long term outcomes because, the incidence of complications tends to be high after liver transplants, especially in patients who were severely debilitated pre-transplant. Surgical complications directly related to the operation include postoperative hemorrhage and anastomotic problems. The medical complications are mostly non-hepatic and include pulmonary impairment, renal dysfunction, malignancy, cardiovascular disease, hypertension, diabetes mellitus, and neurological complications.

The pulmonary system is one of the most common sites of complications post-transplant. Infectious and noninfectious pulmonary complications “with a prevalence ranging from 60 and 87% of liver recipients” have been shown to increase the length of hospital stays. Noninfectious complications such as pulmonary edema, pleural effusion, atelectasis, and acute respiratory distress syndrome predominate during the first week, and generally manifest with respiratory distress and hypoxemia. The lungs are a very common site of post-transplant infections, which predominate after the first post-transplant week. (Dupton, & Verleden, 2011 and Nobili, et al. 2012).

Therefore, it is important for liver transplant candidates and their families to understand the basic process involved with liver transplants, to appreciate some of the challenges and complications that face liver transplant recipients, and to recognize symptoms that should alert recipients to seek medical help. So, every hospital which performs transplant has dedicated nurses that provide specific information about the procedure and answer questions that families may have. (Baldoni, 2008, and Guillen, Black, Thomas, & MacNamara, 2012).

Kaltsakas, et al. (2013) and Mendes, et al. (2013) stated that, effective preoperative teaching has a positive impact on the first 24 hours after surgery. If patients understand that they must perform respiratory exercises to prevent pneumonia; and that movement is imperative for preventing blood clots, encouraging circulation to the extremities, and keeping the lungs clear; they will be much more likely to perform these tasks. In addition, pre-operative teaching is a vital part of nursing care. Studies have shown that pre-operative teaching reduces patient's anxiety and post-operative complications and increases their satisfaction with the surgical experience. Proper preoperative teaching also facilitates the patient's return to work and other activities of daily living. Moreover, the degree to which patients are knowledgeable about post-transplant care can affect outcomes and patients' satisfaction. Transplant team members must identify knowledge gaps, contributory factors, and innovative methods to address learning needs (Wager, Johnson, & Kidd, 2006; Myers, & Pellino, 2009 and Berman, & Syders, 2012).

2. Aim of the study

To evaluate the impact of a designed nursing intervention protocol about preoperative liver transplantation care on patients' outcomes as indicated by: patients' knowledge & practice mean scores, and complications developed, at El Manial University Hospital.

3. Operational definitions:

3.1 Nursing intervention protocol about preoperative liver transplantation care:

It provide information related to the following areas: knowledge about liver, general information about liver transplantation, knowledge about postoperative monitoring till discharge, knowledge about follow up and visiting system in ICU, knowledge about nutrition pre and post liver transplantation, Knowledge about immunosuppressive drugs, and application of different respiratory exercises (deep breathing, coughing exercises & using of the respirometer), ROM and mobility in and out bed.

3.2 Patient's outcomes are operationally defined as:

The acquisition of knowledge related to pre/post care evidenced by the results of post test, and mastery of performing breathing, coughing, using respirometer and range of motion exercises as evidenced by the related checklists, in addition to the development of post liver transplantation complications such as respiratory complications (pleural effusion, pulmonary embolism, & respiratory infection), deep venous thrombosis and pressure ulcer as evidenced by free physical signs in addition to free; chest X-ray, Doppler Ultrasonography, and skin integrity. In addition to wound condition, and reporting of early signs of rejection.

4. Research Hypotheses:

To fulfill the aim of this study the following hypothesis was formulated:

4.1 Patients undergoing liver transplantation who will be exposed to the designed nursing intervention protocol about preoperative liver transplantation care will show better outcomes as regards to their knowledge & practice scores and the occurrence of certain complications.

Subhypotheses:

H 4.1.1- The mean post knowledge scores of liver transplantation patients who will be exposed to the designed nursing intervention protocol about preoperative liver transplantation care will be higher than their pre mean knowledge scores.

H 4.1.2- The mean post practice scores of liver transplantation patients who will be exposed to the designed nursing intervention protocol about preoperative liver transplantation care will be higher than their pre mean practice scores.

H 4.1.3- The pulmonary complications of liver transplantation patients who will be exposed to the designed nursing intervention protocol about preoperative liver transplantation care will be lower than that their correspondence over the last consecutive three years (control group).

H 4.1.4- The frequency of post liver transplantation's lower limb complications of patients who will be exposed to the designed nursing intervention protocol about preoperative liver transplantation care will be lower than that their correspondence over the last consecutive three years (control group).

H 4.1.5- The patients who will be exposed to the designed nursing intervention protocol about preoperative liver transplantation care will have intact skin integrity as compared to their correspondence over the last consecutive three years (control group).

5. Material and Methods:

5.1 Research design

Quasi-experimental design was utilized in the current study.

5.2 Setting

The study was carried out at the Liver Transplantation Unit at El-Manial University Hospital, Cairo University.

5.3 Subjects

A convenience sample including, all adult male and female patients who were scheduled for liver transplantation surgery throughout a period of one year (September 2011 to October 2012).

5.3.1 Inclusion criteria:

- able to communicate and having an intact senses (hearing & vision).

5.3.2 Exclusion criteria:

Smokers was excluded from the study sample.

5.4 Tool of data collection:

Four tools were used to collect data pertained to this study, these tools were tested and piloted by the investigator which are:

5.4.1 Sociodemographic and medical data sheet:

It consists of 12 items covering two main sections: the first section is related to sociodemographic data which includes age, gender, occupation, marital status, and level of education. The second section covers medical data such as date of admission, smoking habits, diagnosis, past medical history, and comorbidity diseases such as diabetes, hypertension (items from 7- 12).

5.4.2 Pre/Post knowledge assessment questionnaire sheet:

This sheet was developed to assess patients' knowledge about liver transplantation; It consists of 41 questions covering the following areas: general information about liver, general information about liver transplantation, knowledge about postoperative monitoring till discharge, knowledge about follow up and visiting system in ICU, knowledge about nutrition pre and post liver transplantation, Knowledge about immunosuppressive drugs, and Knowledge about benefits of different respiratory exercises and ROM.

Scoring system:

Each right answer got one score with total scores of 80.

- Scores less than 48 (< 60%) are considered as unsatisfactory.
- From 48-64 (60%-80%) are considered as satisfactory.
- From 65-80(>80%) are considered as good.

5.4.3 Observational checklists:

This sheet was designed to assess patients' ability to practice different exercises, It includes 42 items, covering 5 main sections; the first item is related to deep breathing exercise (Items from 1-5), the second is related to cough exercise (items 6-12), the third is related to breathing exercise by using respirometer (item 13- 19), The fourth related to passive and active range of motion exercises to upper extremities (Items from 20-33), and the last section related to passive and active range of motion exercises to lower extremities (items from 34-42).

Scoring system:

Checklist is an assessment tool for recording patient's performance for different exercises. Each correct item in the checklist got one score for done and 0 for not done items with a total scores of 42. Then, it is divided into the following levels:

- Scores less than 25 (< 60%) are considered as unsatisfactory.
- From 25-34 (60%-80%) are considered as satisfactory.
- From 35-42(>80%) are considered as good.

5.4.4 Complication assessment sheet:

This sheet was designed to assess development of complications, it include 6 selected complications "wound condition, signs and symptoms of organ(s) failure and/or rejection, the development of respiratory complications (pneumonia, pulmonary embolism), DVT, and pressure ulcer" .

5.5 Methods

The current study was carried out on two phases:

5.5.1 Preparation phase:

The preparation phase was concerned with designing the nursing intervention protocol about preoperative liver transplantation care and construction of the different study tools. The contents of the liver transplantation instructional booklet and the study tools were reviewed by a panel of 5 critical care medical and nursing experts to ensure content validity.

As regard to the data collection from files of a correspondent number of patients over the last consecutive three years. After taking the permission, the examiner started to check the files and document the complications developed after transplantation. The data collection documented through 4 months 2010 / 2011 in the liver transplantation department. A total number of patients who had liver transplantation surgery throughout those three years were 52 patients.

A pilot study was carried out on two patients. Based on the results of the pilot study, minimal modifications were done in the data collection tools and the instructional booklet, therefore, the two patients who shared in the pilot study were included in the actual study sample.

5.5.2 Implementation and evaluation phase:

Once the official permission was granted to proceed with the proposed study, implementation and evaluation phase was initiated. Data of the current study were collected from the September 2011 to October 2012; a total number of 14 patients who fulfilled the criteria of inclusion were recruited into the present study, 3 of them were died with an attrition rate of 21.4%. The purpose and nature of the study explained to all subjects then a written consent was obtained from them in the first meeting. Those patients were met 3-5 times before transplantation and on daily bases after transplantation till discharge. This was in addition to the allocated assessment times that were on the first contact with the patient, immediately post program implementation and before discharge. In addition, during this stage, ethical consideration to ensure patient's right. During data collection the patients were informed that they were free to either participate or not in this study and have the right to withdraw from the study at any time without any rational. Also, the confidentiality and anonymity of each subject were assured through coding of all data.

Data for analysis:- were obtained from the study tools that were categorized, tabulated, analyzed and data entry was performed using the SPSS software (statistical package for social sciences version 20). Descriptive statistics were applied (e.g. mean, standard deviation, frequency, percentage). Tests of significance were performed to test the study hypotheses (i.e. Friedman test, and chi square test). A significant level value was considered when $p < 0.05$.

6. Results

Statistical findings of the current study will be presented in two main sections: section (I) represents socio-demographic & medical data of the studied sample (tables 1). Section (II) delineates answers for the hypothesis testing for being supported or not (tables 2 to 7).

Table (1) shows that, the majority (90.9 %) were males, and more than half (54.5%) of them were aged between 40 and 50 years old with a mean age of (50+4.8). Also, 72.7 %, 90.1%, 81%, & 60 % were employee, married, have Liver Cirrhosis, and stayed in the hospital from 11 to 20 days, respectively.

Table (1): Socio-demographic and Medical Data of the Study Subjects (n=11).

Characteristics	Study Group n=11	
	No	%
Gender		
1.Male	10	90.9
2.Female	1	9.1
Age:		
1. > 40-50	6	54.5
2.>50- 60	5	45.5
Mean+ SD	50 +4.8	
Level of Education:		
1.Illiterate	1	9.1
2.Secondary school	3	27.3
3.University education	6	54.5
4.Postgraduate	1	9.1
Occupation:		
1.Employee	8	72.7
2.Farmer/ worker	1	9.1
3.Retired	2	18.2
Marital Status		
1. Married	10	90.9
2.Widow	1	9.1
Diagnosis:		
1. Liver Cirrhosis	9	81.8
2.Hepatitis C and Liver Cirrhosis	1	9.1
3. Liver failure	1	9.1
Length of hospital stay: (n=10)		
1. <10 days	1	10
2. 11 – 20 days	6	60
3. > 20 days	3	30
Mean+ SD	18.7 + 5.4	

Section (II): related to answers of research Hypotheses:

Table (2) demonstrates higher total & subtotal post mean knowledge scores regarding knowledge about Liver function, general knowledge about liver transplant, knowledge about patient's monitoring postoperative and after return to home, knowledge about visit's rules, knowledge about nutrition before and after transplantation, Knowledge about postoperative medications (immunosuppressant) and knowledge about benefits of breathing and range of motion exercises throughout the study periods among the study group subjects as compared to their pre-implementation score, with a highly significant statistical difference with the following X& P values (x= 15.16, x= 14.1, x= 14.1, x= 15.2, x=14.8, x=16.0, x=18.8, & x= 18.2 at p= 0.000 for x values) respectively.

Table (2): One Way Repeated Measures Friedman test of Total and Subtotal Mean Knowledge Scores of the Study Subjects throughout the Study Period (n=11):

Assessment Period Item	Before implementation Mean + SD	After implementation Mean + SD	Before discharge Mean + SD	X / P value
Knowledge about Liver function (5)	2.09 + 1.04	4.2 + 0.78	4.3 + 0.67	15.16 / 0.001*
General Knowledge about liver transplant (17)	7.8 + 2.99	12 + 1.9	14.5 + 1.9	14.1 / 0.001*
Knowledge about patient`s monitoring (18)	6.27 + 4.3	12.9 + 2.02	14 + 1.05	14.1 / 0.001*
Knowledge about visit`s rules (4)	1.5 + 1.1	3 + 0.89	3.7 + 0.48	15.2 / .00*
Knowledge about nutrition (11)	4.7 + 2.3	8.5 + 1.1	9.4 + 0.69	14.8 / 0.001*
Knowledge about medications (immunosuppressant) (17)	1.36 + 0.9	12.2 + 3.7	13.7 + 2.49	16 / 0.00*
Knowledge about respiratory exercises and ROM (8)	2 + 1.5	5.2 + 1.19	6.4 + 0.84	18.5 / 0.00*
Total (80)	25.8 + 10	57.3 + 7.7	66.3 + 2.9	18.2/ 0.00*

* Significant at the $p < 0.05$ probability level

Table (3) shows that, all of the study subjects (100%) were having unsatisfactory level of knowledge before implementation of the program while 81.8% were having satisfactory level of knowledge after implementation of the program and 63.6 % were having good level before discharge from the hospital with statistical significant difference. So, hypothesis 4.1.1 can be supported.

Table (3): Knowledge Score Levels among Study Subjects throughout Different Assessment Periods (n=11):

Assessment period	Study Group n=11					
	Unsatisfactory < 48		Satisfactory 48 - 64		Good 65- 80	
	No	%	No	%	No	%
Before implementation (n= 11)	11	100	-	-	-	-
After implementation (n= 11)	-	-	9	81.8	2	18.2
Before discharge (n= 10)	-	-	3	27.3	7	63.6

NB: one subject died post-transplantation

Table (4) reveals higher total & subtotal post mean practice scores regarding respiratory exercises (deep breathing, cough exercises & using respirometer) as well as range of motion exercises for upper and lower extremities throughout the study periods among the study subjects as compared to their pre-implementation score, with a highly significant statistical difference with the following: ($x = 19.4$, $x = 17.8$, $x = 29.4$, $x = 17.6$, $x = 17.6$, $x = 20$, $x = 14.8$, & $x = 17.6$ at $p = 0.00$ for x values) respectively.

Table (4): One Way Repeated Measures Freidman Test of Total and Subtotal Mean Practice Scores among the Study Subjects Throughout Different Assessment Periods (n=11):

Assessment Period Items	Before implementation Mean + SD	After implementation Mean + SD	Before discharge Mean + SD	X / P value
Deep breathing exercises (5)	0.9 + 0.94	4.9 + 0.3	5 + 0.0	19.4 / 0.00*
Coughing exercises (7)	0.64 + 0.8	6.5 + 0.68	6.9 + .03	17.8 / 0.00*
Using respirometer (7)	0 + 0	6.8 + 0.4	7 + 0.0	29.4 / 0.00*
Total (19)	1.5 + 1.6	18.27 + 1.01	18.9+ 0.31	17.6 / 0.00*
Upper extremities ROM (14)	1.7 + 1.7	13.36 + 1.02	13.5 + 0.85	17.6 /0.00*
Lower extremities ROM (9)	1.18 + 0.98	9 + 0.0	9 + 0.0	20 / 0.00*
Total (23)	4.18 + 3.2	22.36 + 1.02	22.5 + 0.85	14.8 / 0.001*
Total (42):	4.9 + 3.67	40.4 + 1.57	41.5 + 1.18	17.6/ 0.00*

* Significant at the $p < 0.05$ probability level

Table (5) demonstrates that, all of the study subjects (100%) were having unsatisfactory level of practice score before implementation of the program while 100% & 90.1 % were having good level of practice scores after implementation of the program and before discharge from the hospital with statistical significant difference. So, hypothesis 4.1.2 can be supported.

Table (5): Practice Score Levels among the Study Subjects throughout Different Assessment Periods (n=11):

Practice Level Assessment period	Study Group n=11					
	Unsatisfactory < 25		Satisfactory 25 - 34		Good 35- 42	
	No	%	No	%	No	%
Before implementation (n= 11)	11	100	-	-	-	-
After implementation (n= 11)	-	-	-	-	11	100
Before discharge (n= 10)	-	-	-	-	10	90.1

NB: one subject died post-transplantation

Table (6) represents the occurrence of respiratory complications developed among the study group and their correspondence over the last consecutive three years, this table reveals that, (45.5%) of the study group subjects as compared to (38.4%, 7.7% & 7.7%) of their correspondence over the last consecutive three years were having pulmonary effusion, chest infection, and other respiratory problems respectively.

Table (6): Comparison Between the study group subjects and their correspondence over the last consecutive three years as Regards to respiratory Complications (n=11 and n= 52):

Types of Complications	Study group n=11		Retrospective group(one month posttransplantation) n=52	
	No	%	No	%
Respiratory complications:				
1. Pleural effusion	5	45.5	20	38.4
2. Chest infection	0	0	4	7.7
3. Other respiratory problems:				
- Rt. lower lobe lung collapse	0	0	2	3.8
- pulmonary hypertension	0	0	1	1.9
- hypoxia and dyspnea	0	0	1	1.9

Table (7) represents development of lower limb problems, wound problems, rejection and presence of bed sore among the study group and their correspondence over the last consecutive three years, this table reveals that, (9.1% &9.1%) of the study subject developed acute cellular rejection and ascites as compared to (1.9 % &9.6%) of their correspondence over the last consecutive three years. As well as no additional complications revealed in the study group subjects during their hospitalization period compared with 1.9 % had DVT, 21 % had lower limb edema, 13.5% had wound infection and 5.7 % had bed sore according to the hospital records during the first 3 months after transplantation.

Table (7): Comparison Between the study group subjects and their correspondence over the last consecutive three years as Regards to lower limb problems, wound problems, rejection and development of bed sore (n=11 and n= 52):

Types of Complications	Study group n=11		Retrospective group (one month posttransplantation) n=52	
	No	%	No	%
Lower limb problem:				
1. DVT	0	0	1	1.9
2. LL edema	0	0	11	21
Wound complications:				
1. Wound infection / discharge	0	0	7	13.5
Others:				
Rejection	1	9.1	1	1.9
Bed sore	0	0	3	5.7
Ascites	1	9.1	5	9.6

NB: Total number of adult cases 52 (for 3 years)

7. Discussion

The teaching-learning process is considered as means by which the patient can acquire knowledge, skills, and be encouraged to participate in their treatment, making decisions and assuming responsibilities. With the knowledge developed, the patient may change its health behavior (Sasso, et.al. 2005, & Mendes, et.al. 2013). Therefore; this study was done with the aim to evaluate the impact of a designed nursing intervention protocol about preoperative liver transplantation care on patient's outcomes at El Manial University Hospital.

The present study delineated that approximately ninety percent of the study subjects were males and more than half of the study sample age was between 40 and 50 years old. This may be related to the increased

incidence of Schistosomiasis (major cause of liver diseases) during 1960's-1980's among Egyptian males more than females (El-Khoby, et.al. 2000; Strickland, 2006, and Kasper, & Fuci, 2010). As well, more than fifty percent of them had university education. In addition, the majority of them (90.1%) were married. In accordance with these results, Hussein, (2012) found that, most of the subjects 95 % were male aged between 40 – 60 years. As well, 77.5% had university education and 95% were married. In addition, Kortob, (2012) reported that 47 (87%) were men, with a mean age $50.9 + 9.6$ years. Also, Santo, et.al.(2010), mentioned that the average age in patients with liver transplantation was 49 years (age range 18–72 years). One hundred sixty five patients were male and fifty female. One hundred fifty-eight (73.5%) were married, 37 (17.2%) were single or widowed, and only 20 (9.3%) were separated. In contrast, Ayoob, (2010) found that the average age of the patients was 35 years (ranged between 1 to 63) and 80 percent were men.

Furthermore, the present study portrayed that more than eighty percent of the study subjects were having Liver Cirrhosis. In an agreement, Tran, & Martin, (2007) stated that, Liver cirrhosis accounts more than 80% of transplant performed in adults. Also, Galant, et.al. (2010) found that among liver transplant patients the most common causes of liver cirrhosis were hepatitis B and C viruses ($n = 16$; 66%) and alcohol abuse ($n = 8$; 34%). In addition, Galant, Forgiarini, & Dias,(2011) found that 8 patients diagnosed with alcoholic cirrhosis, 16 patients with hepatitis caused by hepatitis C virus and 2 by hepatitis B. As well, Stille, et. al. (2012) found that over half of the subjects were transplanted for hepatitis C or alcoholic cirrhosis. In the other hand, Mabrouk, et. al. (2012) stated that, the most common indication for liver transplantation and causes for end stage liver disease were HCV- related end stage liver disease (81.6%), hepatocellular carcinoma (13.7%), in addition to HBV, and cryptogenic cirrhosis.

In an attempt to assess knowledge of liver transplant patients, the results of the current study revealed that a higher statistically significant difference throughout the study periods among the study group subjects as compared to their pre-implementation score, indicating higher total and subtotal knowledge scores among the study group subjects, ranked as satisfactory to good levels. The rational of knowledge improvement among the study group subjects throughout the different assessment periods may be as a result of the provision and explanation of the teaching program. These findings were in the same line with the study done by Myers, & Pellino, (2009) who found that, patient's scores on the knowledge test were high, with a mean of 10.51 (out of 12) and a standard deviation of 1.70. In accordance, Delair, et.al.(2010) reported that the candidates exposed to peer-based intervention reported significantly greater knowledge, greater likelihood of discussing donation, and increased self-efficacy in comparison with those not exposed to the intervention. Also, Urstad, et.al.(2011) Stated that; there were a statistically significant higher level of knowledge was found in the study group compared with the control group, measured both 7–8 weeks post-Transplantation ($p = 0.002$) and six months after the intervention ($p = 0.004$). Moreover, Mendes, et.al. (2013) stated that in the analysis of correct answers to 17 questions in the knowledge assessment instrument on the transplantation process before and after the educational intervention, a statistically significant difference is observed ($P=0.0043$).

Exercise plays an important role in improving patient's health, in this respect, Toma's et al.(2013) found that the exercise training program improved body composition (lean mass and total body skeletal muscle mass), weight, and walking capacity. The improvements were more pronounced within the patients with supervised exercise training compared with the patients on the home-based program. In accordance, the current study results delineated that, a higher statistically significant difference throughout the study periods among the study group subjects as compared to their pre-implementation score, indicating higher total and subtotal post mean practice /exercise scores regarding respiratory exercises (deep breathing, cough exercises & using respirometry) as well as range of motion exercises for upper and lower extremities throughout the study periods ranked as good level. The rational of practice improvement among the study group subjects throughout the different assessment periods may be as a result of the provision of direct demonstration, re-demonstration, and follow up and practical content of the instructional booklet which was given to the study group subjects.

Also, Jones, Coombes, Graeme & Macdonald, (2012) stated two studies reported that, exercise training was well tolerated in patients with cirrhosis and resulted in improvements in exercise capacity (both studies) and muscle mass (1 study). These data are provocative and suggest that measuring and improving the exercise capacity and muscle strength of patients with cirrhosis who are awaiting liver transplantation could potentially improve outcomes. In addition, Rongies, et.al.(2011) found that the majority of aspects of health-related quality of life (physical function, body problems, general health, social function, and emotional reaction) were significantly improved in patients who indicated they regularly engaged in physical exercise. Moreover, Trojeto, et.al.(2011) found that all rehabilitation programs identified included aerobic exercises, strength training, and education and involved a multidisciplinary team. In the other hand, Masala, et.al. (2012) found that liver transplant recipients have a significantly lower physical function than the general population ($P=0.001$). Also, Galant, Forgiarini, & Dias,(2011) found that pre-transplant individuals showed low scores on all questionnaire

scores, especially in areas relating to functional capacity, limited by physical appearance, pain, general health and vitality.

As regards to the patient's complications, the current study revealed that, forty five percent developed respiratory problems among the study group while fifty three percent of their correspondence over the last consecutive three years developed respiratory complications. In addition, eighteen percent of the study subject developed acute cellular rejection and ascites as compared to fifty three percent of their correspondence over the last consecutive three years developed acute cellular rejection, DVT, LL edema, wound infection and bed sore according to the hospital records during the first month post-transplantation. The higher incidence of complications among the liver transplantation recipient may be as a result of pre-transplant physical problems associated with end stage liver disease, complexity of liver transplantation surgery, use of immunosuppressant drugs.

In agreement with the study findings, Hong, et.al, (2006) found that pulmonary infiltrates were detected in 68 of the 131 recipients (42.7%). The etiology of the infiltrates was pleural effusion in 50 patients (73.5%), pneumonia in 6 (8.8%), atelectasis in 6 (8.8%), pulmonary edema in 5 (7.4%), and ARDS in 1 (1.5%). Also, Jiang, Peng, & Yang, (2008) found that of the 62 patients, 29 (46.77%) had pulmonary complications after LT, including pulmonary edema (4, 13.79%), acute lung injury (7, 24.14%), pneumonia (14, 48.28%), and acute respiratory distress syndrome (4, 13.79%). Four patients died one month after operation. In addition, Ayoob, (2010) found that there are variable degree of lung collapse were noticed in the recipients during their course and mostly associated with the presence of concomitant pleural effusion, and this complication had occurred in 9 recipients with an incidence of 30%. In addition, Khalil, (2009) found that 2 patients (1%) developed DVT, and pulmonary embolism, 8 patients (4%) developed hepatic artery thrombosis, and 2 patients (1%) developed portal vein thrombosis.

8. CONCLUSION

Based on the results of the current study, it can be concluded that, liver transplantation patients showed an improvement in their knowledge and practice scores of different breathing, cough, & using respirometer exercises and range of motion. This improvement was manifested in their post total and subtotal mean knowledge and practice scores. In addition, the study subjects developed pleural effusion, rejection, and ascites post transplantation.

The following are the main recommendations:-

1. All patients scheduled for liver transplantation and their families are in need to an adequate knowledge and skills to help them to adapt with their life after transplantation.
2. Establishment of a web site, including all information pertained to transplantation process and all aspect of health education such as different educational materials, Medias and audio-visual aids.
3. Encourage patients to participate in group teaching stress management activities.
4. Provision of seminars to raise health team personnel' awareness about benefits of the liver transplantation patient's education for their provision of care.
5. Replication of the study on a larger probability sample selected from different geographical areas in Egypt is recommended to obtain more generalizable data.
6. Further studies have to be carried out in order to assess nurses' knowledge and practices regarding care of organ transplantation.
7. Psychosocial rehabilitation program should be held to meet the liver transplantation patient's needs.

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