Effect of Patients (Recipients) Educational Strategy on their Health Outcomes Post Liver Transplantation

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Abstract

Background: Providing education for liver transplantation (LT) patients is considered an important role of nurses that helps minimize postoperative complications and improve recovery outcomes. **Aim of the study:** to evaluate the effect of patients' (recipients) educational strategy on their health outcomes post-liver transplantation. **Research design:** Quasi quasi-experimental research design was used. **Setting**: The study was conducted in the Liver Transplantation Unit of the National Liver Institute, Menoufia University, Egypt. **Sample:** A purposive sample of patients who attended the previously mentioned unit for 12 months (n= 50). **Tools:** Three tools were used; (1) The General Data Questionnaire (2) Recipients' Learning needs Assessment (3) Recipients' health outcomes. **Results:** Shows the mean score of total information was 13.92 ± 2.30 pre-educational strategy implementation which improved to 41.56 ± 7.26 and 41.24 ± 8.57 immediately post and at discharge respectively, there was an improvement in the total mean score practice 13.90 ± 18.21 from pre implementing educational strategy, to 41.00 ± 6.73 and 49.48 ± 5.87 immediate post implementing educational strategy and at discharge, respectively. Also, there was a statistically significant improvement in patients' health outcomes post-educational strategy implementation at $p<0.001$. **Conclusion:** The recipients' learning needs of information and practice score about post-operative liver transplantation care significantly improved post implementing the educational strategy. Also, their health outcomes as health-related problems, physical examination, and activity of daily living improved with high statistically significance differences post-educational strategies implementation. **Recommendations:** The need for continuous educational and training programs for patients post-liver transplantation to support them and improve health outcomes. To generalize the findings, similar studies should be replicated on a large sample size in different geographic areas in Egypt.

Keywords: Educational Strategy, Health Outcomes, Liver, Recipients, Transplantation.

Introduction

Chronic liver failure known as end-stage liver disease, where the liver is no longer able to maintain its functions which may ultimately lead to death **(Didilescu et al., 2020).** Liver Transplantation (LT) is considered one of the most complex procedures in modern surgery and is performed when conventional therapeutic resources are not sufficient to treat liver diseases. LT is a lifesaving intervention with around 90% of recipients currently surviving the first postoperative year and subsequent life expectancy now exceeding 20 years. LT typically means a rapid transition from living with end-stage liver failure to a state of health and improved vitality. (**Knihs et al., 2020).**

Orthotropic Liver Transplantation (OLT) is the treatment of choice for patients with end-stage

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liver disease, acute liver failure, hepatocellular carcinoma, and metabolic disorders. As a result of improvement in surgical and anesthesiologic skills, advanced understanding of transplant immunology, and better critical care management of complications, patients survive longer after liver transplantation. It has gradually achieved one-year survival rates of 80-90%. During the early postoperative period, all patients undergoing OLT are admitted to the intensive care unit, as they need a management of both preexisting patient conditions and post-operative complications, usually due to either adverse intra-operative or post-operative events. **(Damaskos et al., 2019)** Liver transplantation process; Liver transplantation (LT) may be prescribed as a curative or life-prolonging for appropriately selected patients with acute liver failure, advanced cirrhosis, hepatic malignancy, or inborn metabolic disorders. Given vast improvements in surgical technique, organ preservation and procurement, and immunosuppression over the past several decades, modern LT is characterized by remarkable improvements in post-transplant patient survival, graft survival, and quality of life. **(Mahmud, 2020)**

The main complications in the immediate postoperative period are related to the function of the graft (dysfunction and rejection), the surgical technique, infections (bacterial, fungal, and viral), and systemic problems (pulmonary, renal, or neurological). In the long term, the complications are typically a consequence of prolonged immunosuppressive therapy and include diabetes mellitus, systemic arterial hypertension, de novo neoplasia, and organ toxicities, particularly nephrotoxicity. **(Gonzalez et al., 2022)**.

Patient education strategy is an important aspect of patient care in transplantation. Successful education increases patient satisfaction and results in improved outcomes and adherence. Learning is defined as the process that allows individuals to permanently change their behavior. It happens when people respond to and receive stimuli from their external environment. When observing changes in learners' performance, this shows that learning has taken place **(Soultan et al., 2022)**

Transplantation outcomes are influenced by culture and differ significantly for minority patients compared to the general population. Obesity and type 2 diabetes mellitus (DM), factors contributing to nonalcoholic fatty liver disease requiring transplant, are notably more common in the Hispanic population **(Mahmoud et al., 2019).** Nurses perform learning activities for patients and their relatives concerning long-term measures to promote health. By doing so, patients can understand the rationale and importance of following the therapeutic regimen proposed by the transplantation team, as well as identify signs and symptoms that may unveil a health-related problem **(Peate& MacLeod, 2020)**

Significance of the study

Liver diseases in Egypt are common with multiple reported etiologies including Parasitic, viral, bacterial, and metabolic causes **(Alboraie et al., 2019).** Also, an estimated 8–10 million people suffer from viral hepatitis in Egypt. Hepatitis A virus (HAV) and hepatitis E virus (HEV) are the major causes of viral hepatitis in Egypt. Over 60% of the Egyptian population test seropositive for anti-HEV in the first decade of life. HEV mainly causes self-limiting hepatitis; however, cases of liver failure were reported in Egypt. Hepatitis B virus (HBV), hepatitis C virus (HCV), and hepatitis D virus (HDV) are the main causes of chronic hepatitis, liver cirrhosis, and liver cancer (hepatocellular carcinoma [HCC]) in

Egypt which lead to liver transplantation **(Elbahrawy et al., 2021)**

According to National Liver Institute records, **Shebin ELkoom, Menoufia Governorate,** the total numbers of cases of liver transplantation during the year 2020 was around 40-45 cases, and about 60-70 cases followed in the institute after liver transplantation in other centers. **(Statistical Office at Shebin ELkoom, Menoufia University Hospital, 2021).** Many studies are important because of the difficulty and comprehensive nature of the transplantation process which requires the consistent provision of information and the high prevalence of patients suffering from end-stage liver diseases

Aim of the study:

This study aimed to: Evaluate the effect of patients' (recipients) educational strategy on their health outcomes post-liver transplantation

Research hypothesis

H1: The mean of recipients' learning needs of information score about post-operative liver transplantation care will be significantly higher post-implementing the educational strategy than before.

H2: The mean of recipients' learning needs of practices score about post-operative liver transplantation will be significantly higher post implementing the educational strategy than before.

H3: The recipients who will be exposed to the educational strategy about post-operative liver transplantation care will improve significantly in their health outcomes as health-related problems, physical examination, and their activity of daily living than before.

H4: There will be a significant relation between recipients' learning needs, health-related problems, physical examination parameters, and activity of daily living pre and post-implementing the educational strategy.

Subjects and Method

Research design

A quasi-experimental pre and post-intervention comparison research design was implemented to achieve the aim of the present study.

Study setting

This study was carried out at the Liver Transplantation Unit of the National Liver Institute, Menoufeya University, Egypt which is considered the first center in the Middle East where liver transplantation takes place and it differentiates from other transplantation centers by high attendance and following of patients from all over Egypt and the Middle East.

Subject:

A purposive sample consisted of fifty patients with liver diseases who underwent liver transplantation surgery in the liver transplantation unit at the National Liver Institute, Menoufeya University; Patients were enrolled in the study over twelve months from the beginning of December 2022 to the end of November, 2023.

The sample size was calculated according to the following formula: **Stephen Thompson's equation (Fearon et al., 2017):**

$$n = \frac{N \times p\,(1-p)}{\left(\left(N-1 \times \left(d^2 \div z^2\right)\right) + p\,(1-p)\right)} = 50$$

Data Collection Tools

Three tools were used to collect data for this study as the following:

Tool I: **The General Data Questionnaire**: It was adopted by **(Mahmud, 2020)** to assess recipients' demographic characteristics and medical history for patients with liver transplantation. It was collected by the researcher and consisted of the following parts:

Part I: Demographic characteristics of recipients: This part is concerned with the assessment of patients; and demographic characteristics and includes (7) questions as

age, gender, marital status, level of education, nature of work, residence, and treatment costs.

Part II: - Recipients' medical history: This part aimed to assess patients 'medical data of the past and current disease and its management as well as, the lifestyle of the patients with liver transplantation and included (11) questions related to the onset of diagnosis of liver failure, associated physical disorders, causes of liver failure, main complain when diagnosed, family history of liver disease, previous hospitalization due to liver disorders, previous medication, smoking, number of cigarettes per day, previous blood transfusion, number of transfused bags and sleeping alteration.

Tool II: Recipients' Learning Needs Assessment. It was designed by the researcher after reviewing related and recent literature and aimed to assess patients' information and practical needs and consisted of two parts:

Part I: Recipients' informational needs Assessment Questionnaire.: It was adopted from **(Craig & Heller, 2021)** It aimed to assess patient's informational needs regarding liver transplantation pre and post-educational strategy implementation. It included 27 open-ended questions.

Scoring system: The correct and complete answers were given two scores, correct but incomplete answers were given one score, and the wrong answers were given zero scores. These scores were summed-up and converted into a percentage, the total score was 54 marks equal to 100%, and categorized as the following

A score of >80% referred to a good level of knowledge. Score 65%-≤ 80% referred to the average level of knowledge and score >65% referred to a poor level of knowledge.

Part II: Recipients' practical level needs observational checklist (pre and post-educational strategy implementation). It was adopted from (**Shedeed et al., 2021**) and aimed

to assess the recipients' practices of different exercises used post-liver transplant that minimize post-operative complications. It was observed by the researcher and included: early gradual ambulation, deep breathing exercises, cough exercises, Burger Allen exercises, and wound care practices.

Scoring system: One mark was given for each step correctly done and a zero mark for not done

Tool III: Recipient Health Outcomes It was adopted from (**Donna et al., 2012 & Hablas et al.,2020 & Shedeed et al., 2021**) and aimed to assess the recipient's health deviations post-operative liver transplantation as the item's effect of the educational intervention that was given to the patients preoperatively and implemented by the patients post-operatively. It included the following parts

Part I: Recipient's Health-related Problems: (Post-operative and follow-up) It included (7) sections as follows:

1: Level of mobility included five levels as follows 1: Ability to walk quickly without support.

Level 2: One hand needs support to walk quickly.

Level 3: Both hands need support to walk quickly.

Level 4: Bedridden but not sedentary 100%, able to use a self-propelled wheelchair.

Level 5: Bedridden and 100% immobile, High risk of bed sores.

2- Breathing problems such as difficulty breathing, dyspnea, dry and wet cough, and flu-like symptoms

3- Cardiovascular problems such as heart palpitations ,peripheral swelling, dizziness when changing position to stand ,cold extremities, delayed capillary refilling , cyanosis and bleeding

4- DVT problems such as pain, peripheral swelling, redness, numbness, tenderness

5- Skin and wound problems as: as pain in wound site due to infection, swelling around wound, redness of the wound, humidification as dryness, moist, scratch.

6- Gastrointestinal problems such as vomiting, nausea, diarrhea, or constipation.

7- Elimination problems: It included urination: urinary retention, dysuria, and RBCs in urine.

Part II: Pain assessment: It included the following two measures:

1-Numeric Pain Rating Scale (NPRS). It was adopted by (Benjamin & Charles, 2019). It aimed to assess patients' pain intensity. It is an instrument that reflects the intensity of patients' pain, consisting of a 10 cm straight line, with 11-point ranges from '0' representing no pain to '10' representing (the worst pain imaginable)

Scoring system for numeric pain rating scale:

The values on the pain scale correspond to the pain levels as follows:

Zero was considered "no pain." **1-3** was considered "mild pain." **4-6:** was considered "moderate pain." And **7-10**: was considered "severe pain"

2-Subjective expressed pain: It aimed to assess the patient's experience of pain characteristics according to their description, it included (3) questions as follows: frequency, pain type, and pain site. The studied patients were answered by selecting the proper characteristics according to their experience of pain.

Part II: Physical Examination: **(Post-operative and follow-up)**

It was concerned with clinical assessment data; it was observed as a baseline objective data assessment postoperatively by the researcher and medical records. It included:

1-Vital Signs Assessment parameters to determine infection and orthostatic hypotension, and signs of rejection. It was

adopted from **(Sapra et al., 2020 & Ball et al., 2023)**

2- Liver Function test values, it was adopted from (**Bertolini et al., 2020**)

3- Body mass index (BMI): It aimed to assess the BMI of patients. It will categorize into four levels: Underweight (BMI < 18.5), normal weight (18.5 -< 24.9), overweight (25.0-29.9), and obesity (BMI = 30 or greater it was adopted by **(Van son et al., 2020).**

Part III: Barthel Index for Activities of Daily Living (ADL): This tool was adopted by **(Donna, 2012)** to assess the patient's ability to perform activities of daily living independence. The scale composed of 10 categories "bowels control, bladder control, grooming, toileting, feeding, transferring, mobility, dressing, stairs climbing and bathing". Each category has 3 items "completely dependent, needs assistance, and independent".

Scoring system for Barthel Index:

The scores responses for every item were as follows: Completely dependent was scored zero, need assistant was scored 1 and independent was scored 2.

The total scores of independence level ranged from 0-20, the higher scores reflect the higher independence level. It was categorized as the following:

0- 6 was considered "completely dependent".
7-13 was considered "needs assistance ". and 14-20 was considered "independent".

Educational strategy program:

The educational program was designed by the researcher through review of related literature. This program aimed to improve health outcomes for patients after liver transplantation by implementing an educational strategy for recipients. It included a definition of the liver, its function, liver transplantation, discharge plans, health education for the patient, the follow-up after discharge, proper diet, and medications after

transplantation. In addition, learn how to maintain the patient's psychological and social health. As well as apply deep breathing exercises and coughing exercises and using Burger Allen exercises. **Teaching strategies used were** discussion, demonstration and re-demonstration, videos for clinical procedures, a booklet, and a poster**.**

Tools validity:

The face and content validity of the tools were checked by a jury consisting of five experts in the field of Medical-Surgical Nursing from the Faculty of Nursing, at Benha University. The experts reviewed the tools to check the relevancy, simplicity, clarity, comprehensiveness, and applicability of the questions. The consensus among experts regarding the questionnaire was 98 %, and the observational checklist and patients' health outcomes assessment sheet were 99 % for most items. Also, a designed program that covered all items related to liver transplantation care for post-liver transplantation patients' based on recent current literature, it was revised by the same experts then all required modifications were done consequently and the final form of the tools was used for data collection.

Tools reliability:

In the present study, reliability had been tested using Cronbach's alpha coefficient Reliability of the following

Table (1): Alpha Cronbach reliability analysis for the study tools (as general).

Tools	Alpha	p
knowledge questionnaire	0.835	<0.001
Checklist	0.941	<0.001
complications sheet	0.820	<0.001
Barthel Index scale	0.81	<0.01
Pain scale	0.83	<0.01

Ethical considerations:

The ethical research considerations in the study included the following:
▪ The study approval was obtained from the Ethical Committee of Nursing Faculty before initiating the study work.
▪ The researcher clarified the purpose and aim of the study to patients included in the study before data collection.
▪ Verbal consent was obtained from the patients to participate in the study.
▪ The researcher was assured of maintaining anonymity and confidentiality of data.
▪ The patients were informed that they were allowed to choose their participation in the study and they have the right to withdraw from the study at any time.

Pilot study:

A pilot study was conducted on 10% (5 patients) of the study subjects to test the clarity and applicability of the study tools and the program, also to estimate the time required for each tool to be filled by the researcher as well as to identify any possible obstacles that may hinder data collection. Based on the results of the pilot study the necessary modifications were done for more applicable tools to collect data. The patients selected for the pilot study were excluded from the study subjects. The pilot study was done two weeks before starting the study.

Fieldwork:

Data collection of the current study was carried out through twelve months, from the beginning of December, 2022 to the end of November, 2023. The researcher attended the setting four days (Saturday, Monday, Tuesday and Thursday) per week during afternoon shifts. - Each interview took a time of about 30-45 minutes. The precautionary practice measures for infection control as maintaining physical distance, wearing facemask, gloves and using alcohol aseptic solution for both the

researcher and the patients included in the study. The study was conducted through four phases:

Assessment phase:

It was carried out for all studied patients by the researcher to collect data regarding recipients' sociodemographic characteristics and medical history as general characteristics information using **tool I**, then the researcher collected and observed the recipients' learning needs assessment **pre-operative preparation period and pre-implementing educational strategy** using **tool II** and health outcomes assessment (health-related problems, physical examination, and activity of daily living scale)using **tool III (2ⁿᵈ day of postoperative period)** as a baseline data assessment before implementing the instruction and practicing by the study patients postoperatively (post-liver transplantation).

Planning phase:

Once the initial assessment was finished, an educational strategy was designed based on individual learning needs. The researcher set up a teaching plan covering general and specific objective. This program was developed from recent literatures, revised and modified based on the experts' comments, in order to be implemented using various methods. The program resources and facilities were allocated (printed material and location or site of session that best serves the learner). The researcher determined the timetable of sessions with the patients for starting program sessions.

Implementation phase:

The program implementation had been carried out in liver transplantation unit two days preoperatively and was conducted in 4 sessions (two theoretical session and two practical sessions). Each session lasted about 30-45 minutes/ day for one patient/session considering time table for operation, including periods of discussion according to the patients'

progress and feedback. Motivation, problem solving and reinforcement techniques were used to enhance active participation of the patient in the educational sessions.

➤ 1ˢᵗ session: (introductory session) Explanation of reasons and importance of the program and explain the definition of the liver, its function, causes of liver failure, definition, indications of liver transplantation, preparation for surgery, diet, medication, postoperative complications, and ICU care.

➤ 2ⁿᵈ session: Include applying deep breathing exercises, coughing exercises, and spirometry test.

➤ 3ʳᵈ session: include applying the Burger-Allen exercise, gradual movement exercise.

➤ 4ᵗʰ session: Include health teaching for the patient about the discharge plan, follow-up after discharge, back to work, marriage life after transplantation, patient health practices, personal hygiene, diet, medications, and psychological and social health post-transplantation.

Different teaching and learning methods were used during the sessions which included discussion, demonstration, and re-demonstration, instructional media included mobile videos and printed handouts with pictures, which were presented in clear and concise form to teach patients postoperative liver transplantation care techniques. The program colored booklet was given to each studied patient in order to help them review and support teaching.

At the beginning of the first session, patients were oriented regarding the program contents, its purpose and impact on his condition, and expected outcomes. Each session started with a summary of what had been discussed in the previous session and the objectives of the new session, using simple Arabic language, also the session ended with a summary of its contents,

and feedback was obtained from the patients to ensure that he/ she got the maximum benefit.

At the end of all sessions, the researcher asked them about their opinion on the program and their benefits from the subject. The researcher informed the patients that they will be evaluated by the researcher.

Evaluation phase:

This phase aimed to evaluate the effectiveness of recipients' educational strategies on their health outcomes post-liver transplantation, the researcher evaluated the recipient's information and practices immediately post the sessions as the outcome and on discharge by the same tools of data collection of preprogram implementation through the following phases:

Phase 1: Immediately post-test evaluation was performed after implementing the teaching nursing program preoperatively (following the teaching session) as the outcome and on discharge using **tool II** to evaluate the effectiveness of the program on patients' knowledge and practices & compare the changes in the studied patients' knowledge and practices

Phase 2: Evaluation was done on the 2nd, 4th, 6th, and 8th postoperative days for the following evaluation of patients' practice and health outcomes (tools II & III). Comparing between pre and post-data collected.

Phase 3: The follow-up evaluation is done on the 1st and 3rd months post-discharge using **tool III** (health outcomes assessment). The researcher asked the recipients to follow them on the telephone and to be evaluated in the outpatients' clinic

Data analysis:

Data analysis was performed using the SPSS software (version 25). For determining the normal distribution of quantitative variables to Kolmogorov-Smirnov test. Qualitative data was presented as a number and percent. Furthermore, quantitative data was described as mean or standard deviation, as appropriate. The chi-square test was used to examine the difference and relation between qualitative variables during different periods. Fisher's exact test was applied on smaller sample sizes, the alternative to the chi-square test, when the frequency count is < 5 for more than 20% of cells. Freidman test for differences in dependent quantitative variables between more than two related groups. Cochrane test for differences on a dichotomous dependent variable between three or more related groups For comparing the mean scores in two groups, Mann Whitney test for non-parametric quantitative data and Kruskal Wails for more than two groups. The Spearman-Rho method was used to test the correlation between numerical variables. Linear regression was used for multivariate analyses on the activity of daily living as a dependent factor. A p-value < 0.05 was considered significant, and <0.001 was considered highly significant

Results:

Table (1): shows the frequency distribution of the studied recipients regarding their data. It reveals that 60% of recipients were in the category 40- 60 years old, with a mean age of 46.20 ± 0.98. Males were more prevalent and constituted 80% of the studied patients and 90% of them were married. Regarding their educational level, 50 % had secondary education, 60% of them had manual work and 82% lived in rural areas. Concerning treatment costs, it was found that 60% of them were treated at the state's expense.

Table (2) Shows the mean score, standard deviation, and significant difference of the studied recipient recipients ' information pre and post-educational strategies implementation. It illustrates that there was a statistically significant difference between recipients' information pre and post-

educational strategies implementation at P <0.001 as evidenced by the mean score of general concept about liver was1.22 ± 0.41 and they improved to 5.24 ± 1.13 immediately and they had slightly declined to 4.52 ± 1.11 at discharge post educational strategy. The mean score of recipients' information about liver transplantation was 3.10 ± 1.38 at pre-educational strategy, they improved to 5.12 ± 1.53 and 4.20 ± 0.75 immediately post-educational strategy implementation and at discharge, respectively. Regarding post-liver transplantation complications, the mean score was 2.00 ± 1.10 at pre-educational strategy implementation, they improved to5.94 ± 1.54 and 4.96 ± 1.70 post-immediate educational strategy implementation and at discharge, respectively. The mean score of preventing complications was 1.60 ± 0.80, which improved to 6.94 ± 1.44 post immediately, and they had slightly declined to 6.26 ± 1.96 at discharge post-educational strategy implementation. The mean score of the hospital discharge plan was 6.00 ± 1.80 at pre-educational strategy implementation, they improved immediately post to 19.24 ± 2.74 and 20.38 ± 3.05 at discharge post-educational strategy implementation. The mean score of total information was 13.92 ± 2.30 pre-educational strategy implementation which improved to 41.56 ± 7.26 and 41.24 ± 8.57 immediate post and at discharge, respectively.

Figure (1) illustrates Mean percent score of recipients' regarding their total practice related to liver transplantation pre and post educational strategies implementation. It demonstrates the highest mean percent score 25.71 pre-educational implementation was concerning wound care and increased immediately post-implementation and at discharge to 76.57 and 89.23 respectively. It was observed improvement regarding total practices, 25.27% at pre-implementing educational strategy and then became 74.54%

and 89.96% at immediate post-implementing educational strategy and at discharge

Table (3) shows the frequency distribution of the studied recipients regarding their health-related problems pre and post-educational implementation**.** It revealed post-transplantation complications, it observed that the most common complications on 2nd day of transplantation were bleeding and vomiting with 28% & 24% of studied patients, respectively then it declined to 14 % & 12%, and 18 % & 14% on the 4th day, respectively and disappeared completely at 1 month and 3rd-month post-transplantation. On the other hand, the most common general complications reported by patients were difficulty breathing and palpitation at 26% & 16%, respectively, which declined to 10% & 8% and 10% & 0% on the 4th day and 8th-day post-transplantation, respectively, but at follow up it was observed that these complications were disappeared.

Table (4) shows a correlation between total information and practice with health-related problems, physical examination parameters, and daily living activity among the studied recipient patients pre, post educational strategy implementation. It illustrates that there was a positive correlation between total information and total practice at pre & post-educational implementation. But there was no correlation between health-related problem, physical examination parameter, daily activity with total information and practice pre-educational implementation. Also, there was a negative statistical correlation between total information and practice with the moving ability and pain level at P ≤ 0.05 post 3 months.

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Table (1): Frequency distribution of the studied recipients regarding their data (N.=50).

Personal data	(N.)	%
Age /year		
20-< 40	20	40.0
40-60	30	60.0
SD± ¯χ	46.20 ± 0.98	
Sex		
Female	10	20.0
Male	40	80.0
Marital status		
Married	45	90.0
Single	5	10.0
Educational Level		
Can't read and write	15	30.0
Secondary education	25	50.0
University education	10	20.0
Nature of Work		
Manual work	30	60.0
Mental work	10	20.0
No work/ Household	10	20.0
Residence		
Rural	41	82.0
Urban	9	18.0
Treatment costs		
Treatment at his own expense	10	20.0
Health insurance	10	20.0
At the state's expense	30	60.0

Table (2): Mean score, standard deviation, and significant difference of the studied recipients ' information pre and post-educational strategies implementation (N=50)

Recipients ' information	Pre-educational strategy (n=50) $\bar{\chi} \pm$ SD	Post educational strategy		Fr test	p-value
		Immediately Post educational strategy (n=50) $\bar{\chi} \pm$ SD	At discharge Post educational strategy (n=50) $\bar{\chi} \pm$ SD		
General concept about the liver (Total Score 6)					
Mean ± SD	1.22 ± 0.41	5.24 ± 1.13	4.52 ± 1.11	90.043	<0.001**
Post Hoc test	P1=<0.001**	P2= <0.001**	P3=<0.001**		
Patient information about liver transplantation (Total Score 8)					
Mean ± SD	3.10 ± 1.38	5.12 ± 1.53	4.20 ± 0.75	33.531	<0.001**
Post Hoc test	P1=<0.001**	P2= <0.001**	P3=<0.001**		
Post liver transplantation complications (Total Score 8)					
Mean ± SD	2.00 ± 1.10	5.94 ± 1.54	4.96 ± 1.70	80.978	<0.001**
Post Hoc test	P1=<0.001**	P2= <0.001**	P3=<0.001**		
Preventing complications (Total Score 10)					
Mean ± SD	1.60 ± 0.80	6.94 ± 1.44	6.26 ± 1.96	85.870	<0.001**
Post Hoc test	P1=<0.001**	P2= <0.001**	P3=<0.001**		
Hospital discharge plan (Total Score 22)					
Mean ± SD	6.00 ± 1.80	19.24 ± 2.74	20.38 ± 3.05	96.136	<0.001**
Post Hoc test	P1=<0.001**	P2= <0.001**	P3=<0.001**		
Total information (Total score 54)					
Mean ± SD	13.92 ± 2.30	41.56 ± 7.26	41.24 ± 8.57	77.184	<0.001**
Post Hoc test	P1=<0.001**	P2= <0.001**	P3=<0.001**		

* Significant at p ≤0.05.   **Highly significant at p ‹0.001.

Fr: **Friedman test**, Sig. bet. Periods were done using **the Post Hoc Test** (**Dunn's**)

P1: p-value for the difference between information   pre and immediate post-educational strategy implementation

P2: p-value for the difference between information pre-educational strategy and at discharge

P3: p-value for the difference between information immediately post-educational strategy and at discharge
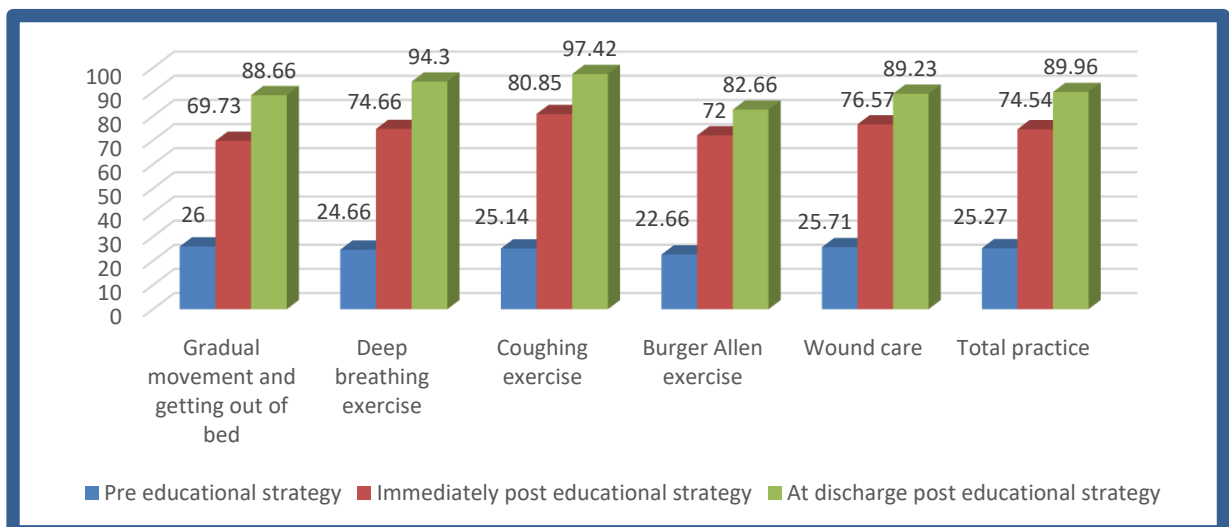

Figure (1): Mean percent score of recipients regarding their total practice related to liver transplantation pre and post-educational strategies implementation (N.=50)

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Table (3): Frequency distribution of the studied recipients regarding their health-related problems and rejection complications   post liver transplantation post-educational implementation (N=50).

Recipients' health-related problems	Baseline		Post		Follow up				Q Test	Pairwise comparisons		
	2nd day of operation		The average percent of the first week		1st-month post-op.		3rd months post-op.			P-value (1)	P-value (2)	P-value (3)
	No.	%	No.	%	No.	%	No.	%				
Breathing problems												
Difficulty breathing	13	26.0	5	9.0	0	0.0	0	0.0	33.294 <0.001**	0.002*	0.001**	0.001**
flu like symptoms	0	0.0	4	7.0	4	8.0	4	8.0	13.846 0.008*	0.001**	0.001**	0.001**
Dyspnea	9	18.0	3	5.0	0	0.0	0	0.0	23.857 <0.001**	0.006*	0.001**	0.001**
Dry Cough	0	0.0	6	11.0	0	0.0	0	0.0	18.545 <0.001**	0.001**	0.001**	0.001**
Wet cough	0	0.0	7	13.0	0	0.0	0	0.0	32.696 **<0.001****	<0.001**	0.001**	0.001**
Cardiovascular												
Heart palpitations	8	16.0	3	5.0	0	0.0	0	0.0	38.345 **<0.001****	<0.001**	0.001**	0.001**
Peripheral swelling	0	0.0	4	7.0	4	8.0	4	8.0	13.846 <0.001**	0.008*	0.001**	0.001**
Dizziness when changing position to stand	5	10.0	4	8.0	0	0.0	0	0.0	26.286 **<0.001****	0.001**	0.001**	0.001**
Cold extremities	5	10.0	3	6.0	0	0.0	0	0.0	16.961 **<0.001****	<0.001**	0.001**	0.001**
Delayed capillary refilling	0	0.0	2	4.0	0	0.0	0	0.0	18.880 **<0.001****	0.001**	0.001**	0.001**
Cyanosis	4	8.0	2	4.0	0	0.0	0	0.0	10.667 **<0.001****	0.031*	0.001**	0.001**
Bleeding	14	28.0	7	13.0	0	0.0	0	0.0	38.629 <0.001**	0.009*	0.009*	0.009*
DVT Problems												
Pain	0	0.0	3	6.0	5	10.0	0	0.0	21.647 **<0.001****	<0.001**	0.001**	0.001**
Peripheral Swelling	0	0.0	1	2.0	4	8.0	4	8.0	13.714 **<0.001****	0.008*	0.001**	0.001**
Redness	0	0.0	2	4.0	1	2.0	0	0.0	12.000 **<0.001****	0.017*	0.001**	0.001**
Numbness	0	0.0	2	0.2	1	2.0	0	0.0	12.000 **<0.001****	0.017*	0.001**	0.001**
Tenderness	0	0.0	2	4.0	4	8.0	4	8.0	84.302 **<0.001****	<0.001**	0.001**	0.001**
Skin, wound Problems												
Paleness or yellowing	0	0.0	2	4.0	4	8.0	4	8.0	84.302 **<0.001****	<0.001**	0.001**	0.001**
Redness	0	0.0	5	10.0	0	0.0	0	0.0	120.715 **<0.001****	<0.001**	0.001**	0.001**
Pain in wound site due to infection	0	0.0	5	10.0	0	0.0	0	0.0	28.000 <0.001**	<0.001**	0.001**	0.001**

Recipients' health-related problems	Baseline 2nd day of operation		Post The average percent of the first week		Follow up 1st-month post-op.		3rd months post-op.		Q Test	Pairwise comparisons P-value (1)	P-value (2)	P-value (3)
	No.	%	No.	%	No.	%	No.	%				
Swelling around wound	0	0.0	4	8.0	0	0.0	0	0.0	13.714 <0.001**	0.008*	0.001**	0.001**
Redness of the wound	0	0.0	4	8.0	0	0.0	0	0.0	13.714 <0.001**	0.008*	0.001**	0.001**
Humidification: Dry	0	0.0	5	10.0	0	0.0	0	0.0	28.000 <0.001**	<0.001**	0.001**	0.001**
Moist	5	10.0	3	6.0	0	0.0	0	0.0	16.961 <0.001**	<0.001**	0.001**	0.001**
Scratch	0	0.0	0	0.0	4	8.0	4	8.0	13.714 <0.001**	0.008*	0.001**	0.001**
Gastro-intestinal												
Diarrhea	0	0.0	3	5.0	0	0.0	0	0.0	9.680 <0.001**	0.002*	0.001**	0.001**
Constipation	0	0.0	7	14.0	0	0.0	0	0.0	33.640 <0.001**	<0.001**	0.001**	0.001**
vomiting and nausea	12	24.0	8	16.0	0	0.0	0	0.0	22.980 <0.001**	<0.001**	<0.001**	<0.001**
Urination Problems												
Urinary retention	5	10.0	4	7.0	2	4.0	0	0.0	62.680 <0.001**	<0.001**	0.001**	0.001**
Dysuria	0	0.0	2	4.0	0	0.0	0	0.0	10.000 <0.001**	<0.001**	0.001**	0.001**
RBCs in urine	2	4.0	0	0.0	0	0.0	0	0.0	77.440 <0.001**	<0.001**	0.001**	0.001**

* significant at p ‹0.05.   **Highly significant at p ‹0.001.   Q: Cochran's test

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Table (4): Correlation between total information and practice with health-related problems, physical examination parameters, and daily living activity among the studied recipient patients pre, post educational strategy implementation (N= 50)

Variables rs\ p values		Baseline				Post three months			
		Total information		Total Practice		Total information		Total Practice	
		r-test	P-value	r-test	P-value	r-test	P-value	r-test	P-value
	Total Practice	0.359	0.018*	-	-	0.449	0.001**	-	-
Health-related problems	Incidence of complications	-0.120	0.407 n.s	-0.273	0.055	-0.273	0.055	-0.293	0.050*
	Moving ability	-0.264	0.064 n.s	-0.124	0.392 n.s	-0.393	0.005*	-0.441	0.003*
	Pain level	-0.035	0.810 n.s	-0.018	0.919 n.s	-0.379	0.007*	-0.584	<0.001**
Physical examination parameters	Heart rate	0.120	0.406 n.s	0.269	0.059 n.s	0.273	0.055	0.496	<0.001**
	Respiratory rate	0.092	0.526 n.s	0.070	0.630 n.s	0.417	0.003*	0.417	0.005*
	Systolic pressure	0.184	0.200 n.s	0.124	0.392 n.s	0.330	0.019*	0.363	0.010*
	Diastolic pressure	0.184	0.200 n.s	0.047	0.746 n.s	0.441	0.001**	0.441	0.003*
	Albumin level	0.269	0.059 n.s	0.092	0.526 n.s	0.273	0.055	0.441	0.003*
	Total protein level	0.058	0.668 n.s	0.120	0.407 n.s	-0.379	0.007*	0.427	0.002*
	Bilirubin	0.037	0.798 n.s	0.126	0.384 n.s	0.363	0.010*	0.320	0.023*
	Prothrombin time	0.024	0.867 n.s	0.016	0.911 n.s	-0.273	0.055	0.281	0.048*
ADL	Daily living activity	0.004	0.978 n.s	0.216	-.130 n.s	0.496	<0.001**	0.623	<0.001**

rs: Spearman coefficient n.s not significant

 : Statistically significant at $p \leq 0.05$ *: Highly Statistically significant at $p \leq 0.001$**

Discussion:

Regarding age, the current study revealed that about two thirds of studied patients were in the category forty to sixty years old with mean age 46.20 ± 0.98, From the researcher point of view, this might be due to end stage of liver disease which common in old age as a result of chronic cirrhosis and liver failure for a long time that necessitating liver transplantation when conventional therapeutic resources are not sufficient to treat liver disease. This result is agreement with study was conducted by **Gratien et al., (2015)** who study about " Personalized adapted physical activity before liver transplantation: acceptability and results " and reported that the mean age of the studied sample was 51 ± 12 years.

As regard to sex, the current study results showed that the majority of the studied patients were male. From the researcher point of view, that might be due to nature of life in urban areas ,as most men work in agriculture and at risk of contracting schistosomiasis and hepatitis, lack of awareness of the correct use

of medications and liver diseases are common in male than female. This finding is agreement with **Kothari et al., (2016),** who studied about "Inpatient rehabilitation after liver transplantation decreases risk and severity of 30-day readmissions, California, United States" and found that more than half of studied patients were males.

Concerning their marital status, the result revealed that most of the studied patients were married. It may be attributed to the Egyptian culture which encourages early marriage. This is in agreement with a study by **Nader & Hafez (2018)** titled " Health Needs Management Program and Compliance with Therapeutic Regimen among Postoperative Liver Transplant Recipients " and found majority of the studied sample were married.

As regard to educational level, the current study showed that almost one half of the studied patients had secondary education. This finding disagreed with **Abdelrahim, (2016)** reported that less than one third of the studied patients were illiterate.

Regarding to nature of work, the current study showed that more than half of study sample had manual work. Also, **Abdullah et al., (2021)** who study " Quality of Life among Elderly Patients with Chronic Liver Diseases at Al-Rajhy Liver Hospital, Assiut University" revealed that more than half of the studied patients were manual workers (farmers).

pertaining to residence, the current study findings revealed that the majority of the studied patients lived in rural areas. This result accepted by **Magdy et al., (2023)** who revealed that the majority of patients were lived in rural areas..

Concerning their treatment costs, the results of the current study revealed that more than half of the studied patients received treatment at the state's expense. From the researcher's point of view, this might be due to the governmental financial support to the patients

for surgery and medication costs. Accepted by **Mokbel et al., (2020)** who studied " Biopsychosocial needs of the patient after Liver transplantation during follow-up period " and discovered that the majority of the studied sample did not have enough income and received their treatment at the state's expense.

The current study revealed that there was statistical significant difference between recipients' information pre and post-educational strategies implementation. This finding was consistent with **Elshamy et al., (2018)** who reported that more than two-thirds of the study participants had good knowledge post-instruction.

Supported by **Nader & Hafez, (2018)** who reported that there were highly statistically significant differences between the result of the pre & post program satisfactory scores of knowledge among study subjects regarding meaning, indication, complications of liver transplantation.

Also, there was improvement in mean score of total information between pre educational strategy implementation & immediate post and at discharge. It might contributed to using different educational strategies which helps the recipients to acquire knowledge about liver transplantation as discussion , demonstration and re-demonstration, videos for clinical procedures, booklet and posters . This result in the same line with **Shedeed et al., (2021)** who revealed that; more than half of the studied patients had poor knowledge pre implementation of HHC model and more than three fifths of the studied patients had good knowledge post implementation of HHC model. Also, Accepted by **Magdy et al., (2023)** who revealed that there was an improvement in mean scores of studied patients' total knowledge regarding self-management post program implementation compared to pre program implementation.

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Concerning total practices, the current study illustrated that there were statistically significant differences regarding the overall practices at pre implementing educational strategy, compared to immediate post implementing educational strategy and at discharge. The rational of practice improvements among the study recipients may be a result of the provision of direct demonstration, re-demonstration, and follow-up of practical content in instructional booklet which was given to the study recipients. These findings in the same line with **El-Shafiey et al., (2017)** who demonstrated higher total and subtotal post mean practice scores regarding deep breathing and coughing exercises, using incentive spirometer, range of motion exercises, and breast self-examination during post implementation periods with significant statistical difference at the following P values =< 0.05.

This finding was supported by **Al Saaid et al., (2019)** showed that there was a highly significant difference among compliance of the study subjects between pre and post counseling sessions regarding physical activity and minority of the study subjects had unsatisfactory practice regarding physical activity pre session that improved to most of study subjects had satisfactory level of practice post session.

Regarding total mean score of practice, the current study revealed that there were statistically significant differences regarding the overall practices related to Gradual movement and getting out of bed after the operation, Deep breathing exercise, Coughing exercise, Burger Allen exercise and Wound care at pre implementing educational strategy , compared to immediate post implementing educational strategy and at discharge as p value= <0.001. This study finding agreed **Elshamy et al., (2018)**, reported that there was

significant improvement of the studied patient's total medication adherence pre and post instruction.

Concerning post-transplantation complications, the current study revealed that the most common complications on 2nd day post-operative were nausea and vomiting whereas more than one-quarter of patients suffered which declined in the first week post-transplantation and disappeared completely on the 3rd-month post-liver transplantation. It might contribute to the high PT which means serious damage to liver function and a higher risk of internal bleeding. Accepted **Thompson et al., (2014)** study entitled " Risk factors associated with reoperation for bleeding following liver transplantation" illustrated that almost one-quarter of the studied patients had experienced bleeding post-admission to the ICU.

Owing to rejection complications, the current study presented that the most common general complication reported by the patient was difficulty breathing and palpitation whereas nearly one-quarter of them suffered from it on the 2nd day of education post-liver transplantation and declined in the first week but disappeared at 1st month & 3rd-month post-transplantation. From the researcher's point of view, it might contribute to the effect of the immunity system which increases the risk of rejection of any weird body. In accordance with **Feltracco et al., (2013)** who studied " Early respiratory complications after liver transplantation" and reported that the minority of liver transplant patients required ventilator support due to pulmonary complications, and more than one-third had to be reintubated. Accepted by **Bozbas et al., (2008)** who studied " Pulmonary complications and mortality after liver transplant" and illustrated that pulmonary complications were detected in less than half of liver recipients.

Regarding correlation between total information and total practice of the study recipient, It was noticed that that there was a positive correlation between total information and total practice **at** pre & post educational strategy implementation. From the researcher point of view, this might be attributed to the fact that the knowledge was the basic of practices which affect positively on their practices. This study finding is agreed with Elshamy et al., (2018) who reported that there was a positive association between total patients' knowledge and patient compliance to immunosuppressive therapy post liver transplantation patient after exposure to instructions was highly statistical significant. In accordance with **El-mahdy et al., (2018)** revealed that there was statistical significant difference between score of knowledge of studied group about chronic hepatitis and their educational level.

The present study showed that there was no correlation between health-related problem, physical examination parameter, daily activity with total information and practice pre-educational strategy implementation. This finding is disagreed with **Shedeed et al., (2021)** and stated that there were positive statistically significant correlations between the studied patients` total quality of life and total practices and total knowledge pre and post implementation of HHC model.

There were negative statistically correlation between total information and practice with moving ability and pain level. Supported by **Reaza& Rodríguez, (2019)** who studied " Effectiveness of nursing educational interventions in managing post-surgical pain. Systematic review" found that nursing educational interventions reduce mobility problems, improve adherence to treatment after surgery and improve relief of post-surgical pain

Conclusion:

The recipients' learning needs of information and practice scores about post-operative liver transplantation care with a significant difference post-implementing the educational strategy. Moreover, there was a positive correlation between total recipient information and practice pre and post-educational strategy implementation. At the same time, the recipients who were exposed to the educational strategy about postoperative liver transplantation care, their health outcomes improved concerning health-related problems and physical examination, and their activities of daily living than before. On the other hand, there was a relation between recipients' learning needs of information and practice with their health-related problems and activities in daily living 3 months post-liver transplant and implementation of the educational strategy. So, the study explored that the health outcomes for recipient patients' post-liver transplantation improved by implementing the instruction of the educational strategy they had taken pre-operatively liver transplant, and they could perform activities of daily living independency

Recommendations:

o The need for continuous educational and training programs for post-liver transplantation to support patients and improve their health outcomes.

o Activating the educator role of the nurses in all health care centers to raise awareness among people about the importance of an early diagnosis, proper treatment, change lifestyle, adherence to medications, and follow up.

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تأثير استراتيجية تعليم المرضى (المتلقين) على نتائجهم الصحية بعد زراعة الكبد

روان محمد السيد-حنان جابر محمد -سماح السيد غنيم- راويه على إبراهيم

تعتبر زراعة الكبد واحدة من أكثر الإجراءات تعقيدًا في الجراحة الحديثة ويتم إجراؤها عندما لا تكون الادوية التقليدية كافية لعلاج أمراض الكبد. زراعة الكبد هو تدخل منقذ للحياة حيث يعيش حوالي 90٪ من المتلقين حاليًا في السنة الأولى بعد العملية الجراحية ويتجاوز متوسط العمر المتوقع 20 عامًا بعد إجراء الزرع. زراعة الكبد تعنى حرفيا الإنتقال من العيش فى مرحلة متأخرة من مرض الكبد إلى العيش بصحة أفضل وتم استخدام تصميم شبه تجريبي لتحقيق هدف الدراسة وتم تطبيق الدراسة في في وحدة زراعة الكبد بمعهد الكبد القومي بشبين الكوم، جامعة المنوفية ، وتم استخدام عينة غرضية مكونه من خمسين مريضا بأمراض الكبد الذين خضعوا لجراحة زراعة الكبد بوحدة زراعة الكبد بمعهد الكبد القومي جامعة المنوفية؛ تضمنت المرضى على مدار اثني عشر شهرًا من بداية ديسمبر 2022 إلى نهاية نوفمبر 2023وتم استخدام ثلاث أدوات لجمع البيانات لهذه الدراسة على النحو التالي،**الأداة الأولى:** استبيان البيانات العامة: لتقييم الخصائص الديموغرافية للمتلقين والتاريخ الطبي لمرضى زراعة الكبد **الأداة الثانية:** تقييم احتياجات التعلم للمتلقين: تم تصميمها من قبل الباحث بعد مراجعة الأدبيات ذات الصلة وتهدف إلى تقييم معلومات المريض واحتياجاته العملية. **الأداة الثالثة:** النتائج الصحية للمتلقين: هدفت الى تقييم الانحرافات والمضاعفات الصحية للمتلقي بعد عملية زرع الكبد باعتبارها النتائج الصحية.وقد أسفرت الدراسة عن النتائج التالية:كان هناك تحسن فى متوسط النتيجة الإجمالية للمعلومات مباشرة عقب التنفيذ وعند الخروج على التوالي. كان هناك تحسن في متوسط درجات الممارسة بعد تنفيذ الإستراتيجية التعليمية مباشرة وعند الخروج على التوالي. كانت هناك فروق ذات دلالة إحصائية عالية فيما يتعلق بأنشطة الحياة اليومية فيما يتعلق بعملية الاخراج ,استخدام المرحاض ,التغذية ,النقل , الحركة ,ارتداء الملابس والعناية.توجد علاقة ارتباطية موجبة بين إجمالي المعلومات والممارسة الكلية في التنفيذ التعليمي قبل وبعد.