

Evaluation of A Nurse-led Training Program on Administering a Recurrent Large-Volume Cleansing Enema in Hepatic Encephalopathic Patients


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Data, headlines, and other materials rely on work of researcher team.

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Abstract

Background: Hepatic encephalopathy is a reversible condition characterized by neuropsychiatric disturbances due to progressive liver dysfunction that has significant morbidity and mortality rates. Administering a recurrent large-volume cleansing enema is one of the main effective collaborative care treatments that can reduce hospital stays. **Aim:** This study aimed to evaluate the effectiveness of a nurse-led training program on administering a recurrent large-volume cleansing enema in hepatic encephalopathic patients. **Methods:** A quasi-experimental design (pretest, posttest, and follow-up) was used in this study. **Setting:** The study was conducted at two intensive care units (hepatic and intermediate) affiliated with the Suez Canal University Hospitals. **Participants:** A convenient sample of sixty-one nurses were recruited from the selected units. **Data collection tools:** Two tools were used to collect the data. The interviewing questionnaire assessed nurses' knowledge and the observational checklist assessed nurses' practice regarding the administering a recurrent large-volume cleansing enema and the assessment of consciousness. **Results:** There was an improvement in nurses' level of knowledge following the program. The satisfactory level of knowledge differed significantly at the pre-program (11.4%), post-program (93.4%), and follow-up (83.6%) phases. In addition, the satisfactory level of practice differed significantly at the pre-program (25.6%), post-program (99.1%) and follow-up (92.2%) phases. The total level of knowledge and practice scores also significantly positively correlated across the study phases. **Conclusion:** The nurse-led training program significantly enhanced the nurses' knowledge and practice scores regarding the administering a recurrent large-volume cleansing enema. **Recommendation:** Considering the current findings, several recommendations may be put forth. First, it is necessary to implement nurse-led training programs in a wider setting at hospitals to promote the efficacy of nursing care. Hepatic care units must also be provided with more Arabic copies of training programs to supply nurses with an understandable guide.

Keywords: Hepatic Encephalopathic Patients, Nurse Performance, Recurrent Large-Volume Cleansing Enema

Introduction

A cleansing enema is one of the most commonly performed nursing care procedures in patients with liver dysfunction. This procedure involves applying a solution with or without medications through an indwelling catheter inserted into the colon/rectum for the purpose of removing feces and/or flatus (Stromberg & Dallred, 2022). Undoubtedly the most common type of enema, this procedure stimulates peristalsis via irritation of the colon/rectum and the induction intestinal distention, resulting in drawing excessive fluids,

metabolic waste products and electrolytes out of the body (Chintamani & Mani, 2021). There are two general types of cleansing enemas, including the large-volume enema (500–1000 cc) and the small volume enema (< 500 cc), In both procedures, the solution is administered at a temperature of 105 °F to 110 °F (40 °C to 43 °C) (Stein & Hollen, 2020).

A large-volume enema is not only designed to clean the colon of as much feces as possible but also is considered as a first-line treatment in patients with hepatic encephalopathy (HE) when administered in combination with

pharmacological agents such as lactulose or/and neomycin to trap excessive fluids, metabolic waste (NH_4^+) or/and electrolytes in the colon (Hinkle & Cheever, 2018; Abo El Ata, Ibrahim, & Ahmed, 2021). A large-volume cleansing enema may be either isotonic (normal saline solution) or hypotonic (tap water) depending upon the solution used, and the patient is asked to keep hold of the solution for as long as possible (Liang et al., 2020).

Hepatic encephalopathy is a reversible deterioration in brain function that occurs because of a severe impairment in liver function that affects not just the quality of life among patients but also their relatives and caregivers (The American Association for the Study of Liver Diseases, 2022). This syndrome may be acute or chronic and is characterized by a spectrum of neuropsychiatric disturbances that occur due to the excessive accumulation of ammonia toxic substances in the blood stream (Chintamani & Mani, 2021; The European Association for the Study of the Liver, 2022). Neuropsychiatric symptoms may include personality changes, disorientation, confusion, a depressed level of consciousness, and coma that can eventually lead to death. Appropriate collaborative preventative and management strategies for liver disease are key to reducing the chances of HE (Stein & Hollen, 2020).

Nurses are in a unique position to assess the abilities of patients, families, and caregivers to deliver supportive treatments, which can reduce obstacles and improve preparations (Rodenbaugh, Vo, Redulla, & McCauley, 2020). A comprehensive nursing assessment of patients with HE is critical to confirm proper care and patient safety (Wong, & Moitra, 2018). These assessments must involve regular evaluations of the patient's level of responsiveness and motor and sensory disturbances, as well as fluids, electrolytes, metabolic wastes, acid/base imbalances, and the possible adverse effects of therapeutic measures (Saad, Abdelkader, Said, & Elsayed, 2021).

Overall, nurses provide supportive care, including providing proper dietary support, skin care, the administration of medications to regulate excessive ammonia levels, cleansing

enemas to prevent and treat constipation, and the assurance of patient safety (Linton & Matteson, 2019). Nurse education on the management of HE is essential, but it is also necessary for patients and families either during hospitalization or at home to support them through the treatment and follow-up care to prevent a reoccurrence of symptoms (Sweeney & Richardson, 2020).

A nurse-led training program is crucial for supporting nurses responsible for the management, co-ordination, and continuity of delivered care (Butcher, Bulechek, Dochterman, & Wagner, 2018). Educator nurses have a vital role to play in allowing nurses to gain necessary knowledge and develop vital skills (Davin, Thistlethwaite, Bartle, & Russell, 2019). A nurse-led training program places the learner at the center of the learning process rather than the instructor, and allows the student to determine how, where, when, and what to learn (Farg, Ibrahim, & Bagdady, 2020).

Significance of the study

Hepatic Encephalopathy is a remarkable clinical feature of decompensated liver cirrhosis that has firmly increased during recent years and concerned with high morbidity rate affects 30-72% of patients with liver cirrhosis, moreover it is negatively impacting patients' quality of life, and it is associated with considerable economic burdens to patients, caregivers, and healthcare system (The American Association for the Study of Liver Diseases, 2022). Despite remarkable governmental role in healthcare system improvements in the running decade, Egypt even now has a mortality rate of HE (Elgohary, Amer, & Bassiony, 2020). Globally, it estimated to affect 5.5 million people in the United States, approximately 70% of may develop symptoms of hepatic encephalopathy (Amodio, 2018 and Bereda, 2022).

Furthermore, evidenced based on previous studies thought that administering a recurrent large- volume cleansing enema is a vital key to shorten the initial period of improvement of encephalopathy via ammonia trapping and improve patient's level of consciousness. Nurses are usually the first members of the

health care team to provide a collaborative care and play a significant role to eliminate problems that interfere with the accuracy of procedure and may lead to life threatening medical decisions. Therefore, the purpose of this study was to evaluate the effectiveness of a nurse-led training program on administering a recurrent large-volume cleansing enema in hepatic encephalopathic patients.

The study's Aim:

To evaluate the effectiveness of a nurse-led training program on administering a recurrent large-volume cleansing enema in hepatic encephalopathic patients.

Objectives:

1. Assess nurses' level of knowledge regarding administering a recurrent large-volume cleansing enema in hepatic encephalopathic patients.
2. Assess nurses' level of practice regarding administering a recurrent large-volume cleansing enema in hepatic encephalopathic patients.
3. Design, implement, and evaluate a nurse-led training program on administering a recurrent large-volume cleansing enema in hepatic encephalopathic patients.

Research hypotheses:

The research hypothesis that, the studied nurses' performance would be improved post implementation of a nurse-led training programme regarding administering a recurrent large-volume cleansing enema in hepatic encephalopathic patients.

Methods

Research design

A quasi-experimental research design (pretest/posttest/follow-up, one group of participants) was used to achieve the aim of this study.

Setting

This study was conducted at hepatic and intermediate intensive care units affiliated with the Suez Canal University Hospitals. The capacities of the hepatic and the intermediate

intensive care units were twelve and ten beds, respectively.

Sample

A convenient sample of nurses (n= 65) was recruited at the previously mentioned settings. Unfortunately, four nurses dropped out of the study post-program for various reasons, including recent pregnancy, turnover, or absenteeism from the study, leaving a total of 61 nurses.

$$\text{Finite population: } n' = \frac{n}{1 + \frac{z^2 \times \hat{p}(1-\hat{p})}{\epsilon^2 N}}$$

where

z is the z score

ε is the margin of error

N is the population size

p̂ is the population proportion

The sample size estimated post added dropout = 10%, with a confidence level C = 98%, and margin error (5%) the study power, population proportion p (83), the z score (1.95), which calculated according to calculator. net website.

Tools for data collection

Two tools were utilized to collect the data for the study:

1. **Nurse's Interviewing Questionnaire:** This is a structured questionnaire written in simple Arabic language. It was designed by the researchers following a review of the related literature (Liang et al., 2020; Rodenbaugh et al., 2020; Saad, AbdElkader, Said, & ElSayed, 2021; Stromberg & Dallred, 2022). This questionnaire was checked by a panel of experts in medical-surgical nursing and internal medicine for its content validity to assess the nurses' knowledge regarding the administering of a large-volume cleansing enema. It was composed of two parts. The first part consisted of seven closed-ended questions to collect demographic data, including age, gender, marital status, educational level, years of experience in the study setting, and participation any hepatic nursing care training courses. The second part assessed the knowledge level regarding the administering a recurrent large-volume cleansing enema. This part of the questionnaire consisted of forty-two true

or false and multiple-choice questions. The questions were classified into:

- a. Knowledge regarding the HE definition, causes, clinical manifestations, nursing and medical management (17 items).
- b. Knowledge regarding the definition, indications, precautions, and hazards of the administering a recurrent large-volume cleansing enema (10 items).
- c. Knowledge regarding the nursing roles before, during, and after the administering a recurrent large-volume cleansing enema (10 items).
- d. Knowledge regarding the interpretation of a patient's output findings after the administering a recurrent large-volume cleansing enema (5 items).

The scoring system: The score of the knowledge ranged from 0-42 grades; based on the correct answer scored one and the incorrect zero grade. The scores of the items added together for each part of knowledge, and the total divided by the number of items, generating a mean score. This score converted to percentile score. The knowledge level was considered a satisfactory if the percent score was $\geq 75\%$ and unsatisfactory if $< 75\%$ (Mohammed, Taha, Mohamed, & Moghazy, 2021)

2. Nurse's Observational Checklist: This questionnaire was used to assess level of the nurses' practice. It consisted of two checklists:

- a. Administering of a large-volume cleansing enema checklist. This checklist included thirty-two steps that were adapted by the researchers (Lynn, 2018; Liang, et al., 2020; Stein & Hollen, 2020). These steps included the preparation before administering a large-volume cleansing enema (7 steps), procedures during the administering of a large-volume cleansing enema (19 steps), and the steps after the administering of a large-volume cleansing enema (6 steps).
- b. Assessment of the level of consciousness checklist. This is a valid and reliable assessment tool that involves the application of the Glasgow Coma Scale adopted by the researchers (Reith, et al.,

2015; Santos, et al., 2016). Three items are used to score eye opening (4 points), verbal abilities (5 points), and motor abilities (6 points) to demonstrably evaluate the level of consciousness and the severity of the brain disturbances during the care of HE patients. The responses receive a total score of 3 to 15, with a score ≤ 8 indicating a severe coma, a score of 9–12 indicating a moderate coma, and a score of ≥ 13 indicating normal consciousness.

The scoring system: Each item of observational checklist given one degree if done completely correctly and zero degree if done incorrectly or incompletely. The score of the steps outlined and the total divided by the number of the steps giving a mean score. This score converted into percentile scores. The studied nurses had a satisfactory level of practice when the total score was $\geq 75\%$, and unsatisfactory if $< 75\%$ (Saad, et al., 2021).

Content validity and reliability

A panel of five professionals (three professors of medical-surgical nursing and two professors of internal medicine) evaluated the face and content validity of the questionnaires. The panel revised the data tools for applicability, clarity, comprehensiveness, relevance, and ease of implementation. The percentage of agreement ranged from 82–100%. Minor adjustments were made in response to their feedback. Reliability was measured by Cronbach's alpha. For the nurse's knowledge questionnaire, it was $p = 0.84$, while for the nurse's practice checklists parts (a) it was $p = 0.89$ and (b) it was 0.86 .

Pilot study

A pilot study was conducted to ensure that the data collection tools were clear, applicable, relevant, and feasible. For this study, six nurses who represented 10% of the study subjects were randomly selected to participate. The nurses who contributed to the pilot study were omitted from the overall sample since minor changes were made after the pilot study was completed.

Field work

Assessment phase: This was conducted prior to the implementation of a nurse-led training program regarding the administering a recurrent large-volume cleansing enema. The

researchers assessed the available locations, equipment, time, supplies, and instructional materials for implementing a training program. During this stage, the two research tools (nurse's knowledge questionnaire and observational checklist) were used to gather data from the studied nurses. The questionnaires were completed during the nurses' work time. The data collected during this phase represented the baseline condition (pretest) for further assessments to evaluate the effectiveness of the nurse-led training program. The average time for the completion of each nurse interview was around 15–20 minutes. A structured interview questionnaire was carried out to assess the studied nurses' level of knowledge regarding the administering a recurrent large cleansing enema and its interpretation that was filled at the interviewing time, while the observational checklist was recruited to assess level of the studied nurses' practice regarding the administering a recurrent large cleansing enema and assessment of consciousness level for HE patients that was filled in between 10–15 minutes by the researchers before implementation of a nurse-led training program (pre phase).

Planning phase: A nurse-led training program regarding the administering a recurrent large-volume cleansing enema was developed in the Arabic language. This program was designed to improve understanding, comprehension, clarity, and applicability based on a needs assessment of the pretest data and a recent related literature review (Campion, 2019; Fabrellas et al., 2020; Mohammed et al., 2021; Bereda, 2022; Stromberg & Dallred, 2022). This training program involved unit-by-unit exams and a model answer at the end of each unit's questions. The program content was evaluated and validated by the experts in medical-surgical nursing and internal medicine based on the general objectives of the study.

The designed training program was developed as a unit-by-unit course by reviewing the related literature, including available magazines, periodicals, and articles, to become acquainted with the different aspects of the research problem.

The program involved the following items: a review of HE, the definition of a large-volume cleansing enema, indications, precautions, contraindications, hazards, the large-volume cleansing enema procedure, and the interpretation of patient output. Principles of education were reviewed and considered for the development of the nurse-led training program and printouts on the related interventions were distributed among the nurses.

Implementation phase: Field work for the data collection process was completed over eight months from the first week of July 2021 to February 2022. The researchers were present at the study setting either during the morning, afternoon, or night shift for a total of 37 hours. The entire study sample (n = 61) was assessed during the first month of the study. In the previously mentioned setting at the treatment or lecture rooms, the recruited nurses were interviewed and given a half hour to complete each unit.

The nurses were separated into small groups (n=3–4) to ensure effective delivery of the knowledge. The educational program was delivered via PowerPoint presentations, videos, handout brochures and papers, and included small group discussions, interactive lecturer, demonstrations, and redemonstrations. An evaluation of the program occurred immediately after delivery (post phase) and after three months (follow-up phase). The training program materials were disseminated to all the nurses in both hard and soft copies.

The nurses met at the end of each session and were informed about the following session's content, time, methodology, and media, as well as asked for feedback. To maintain effective delivery of the training program the nurses were instructed to read each chapter and handout thoroughly, to answer the questions at the end of each chapter, and, after attentively reading each chapter, to proceed to the model key answer. The nurses could consult with the researchers by phone, email, or in-person meetings to discuss any ambiguous aspects of the program and to answer any inquiries.

Evaluation phase: This phase evaluated the effectiveness of the nurse-led training program by comparing the findings pre/post-

implementation and after three months in the follow-up test by using the constructed tools.

Ethical considerations

Approval for the study was obtained from the hospital director and the head nurse of the department after a complete explanation of study's aims, benefits, and methods. Moreover, oral consent was attained from each nurse prior to data collection once the study's aims and methods were explained. The confidentiality and anonymity of any gathered information was achieved through coding. The researchers assured the participants that the collected data would only be used for the purpose of the study. The participants were also informed that no harm was anticipated from the study's implementation and that they could withdraw from the study at any time without penalty or reward.

Statistical analysis

SPSS (version 22) was used to analyze the data. The Kolmogorov-Smirnov test was used to assess normality and to determine the subsequent use of parametric or non-parametric tests. The collected data were summarized using distribution and frequency to describe distinctive characteristics. Independent sample t-tests (t) for related groups and Friedman tests (f) were used to evaluate differences between variables. The significance level was set at $p \leq 0.05$.

Results

Table 1 shows that 67.2% of the studied nurses were aged between 20–<30 years (mean \pm SD of 26.1 ± 3.32 years), while 80.3% of them were female and 54.1% were married. With regard to nursing experience in the study setting, 54.1% of the nurses had less than or equal to 5 years experience (mean \pm SD of 4.59 ± 3.45 years). With regard to receiving specific training courses on care for HE patients, 78.7% had not received any prior training.

Figure 1 shows that 57% of the studied nurses had attended a technical institute, while 7% of them had a specialty diploma.

Table 2 shows that the nurses' level of knowledge regarding HE was satisfactory in 14.7% of participants at the pre phase, in 96.7% at the post phase, and in 86.8% at the follow-up phase. The levels of satisfactory knowledge differed significantly across these phases ($p \leq$

0.05). Furthermore, the level of knowledge regarding administering a large-volume cleansing enema was satisfactory in 18% of nurses at the pre phase, in 98.3% at the post phase, and in 91.8% at the follow-up phase. The level of satisfactory knowledge differed significantly across the study phases ($p \leq 0.05$).

Regarding the studied nurses' level of practice, **Table 2** shows that preparation pre administering a large-volume cleansing enema was satisfactory in 27.8% of participants at the pre phase, in 100% at the post phase, and in 95% at the follow-up phase. This level of practice differed significantly across the study phases ($p \leq 0.05$). Also, the level of practice with post administering a large-volume cleansing enema was satisfactory in 22.9% of participants at the prephase, in 95% at the post phase, and in 91.8% at the follow-up phase. The level of practice significantly differed across the study phases ($p \leq 0.05$).

Figure 2 shows that 11.4% of the studied nurses had a satisfactory total level of knowledge regarding administering a recurrent large-volume cleansing enema during the pre-phase, while post implementation the level of knowledge elevated to 93.4% and lowered to be 83.6% in the follow-up phase. There were statistically significant differences between the pre/post phases, the pre/follow-up phases, and between the pre/post/follow-up phases of implementation of the nurse-led training program ($p \leq 0.05$).

Moreover, **Figure 2** shows that 25.6% of the studied nurses had a satisfactory level of practice regarding administering a recurrent large-volume cleansing enema at the pre phase, while post implementation it increased to 99.1% and reduced to 92.1% in the follow-up phase. There were statistically significant differences between the pre/post phases, the pre/follow-up phases, and between the pre/post/follow-up phases of implementation ($p \leq 0.05$).

Table 3 presents that there was a statistically significant relationship between the nurses' total level of knowledge and age at the pre and follow-up phases ($p = 0.02$ and $p = 0.000$, respectively). Likewise, there was a statistically significant relationship between the total level of knowledge and the demographic data (educational degree, years of experience,

training courses) at all study phases ($p \leq 0.05$).

In addition, **Table 3** shows that there was a statistically significant relationship between the nurses' total level of practice and age at the follow-up phase ($p = 0.03$). As well, there was a statistically significant relationship between the total level of practice and the demographic data (gender, educational degree, marital status,

years of experience, training courses) at the pre, post and follow-up study phases ($p \leq 0.05$).

Table 4 shows that there was a statistically significant correlation between the total level of the nurses' knowledge and their total level of practice regarding administering a recurrent large-volume cleansing enema throughout the study phases ($p \leq 0.05$).

Table 1. The Demographic Characteristics of the Studied Nurses (n = 61).

The Demographic Characteristics	N	%
Age (Year)		
20-<30	41	67.2
30-<40	17	27.9
≥ 40	3	4.9
Mean\pmSD	26.1 \pm 3.32	
Sex		
Male	12	19.7
Female	49	80.3
Marital status		
Single	27	44.2
Married	33	54.1
Divorced	1	1.7
Nursing experience in the study setting (Year)		
<5	33	54.1
6<10	21	34.4
≥ 10	7	11.5
Mean\pmSD	4.59 \pm 3.45	
Receiving specific training courses regarding care for hepatic encephalopathy patients		
Yes	13	21.3
No	48	78.7

Figure 1. The Educational degree of the Studied Nurses (n = 61).

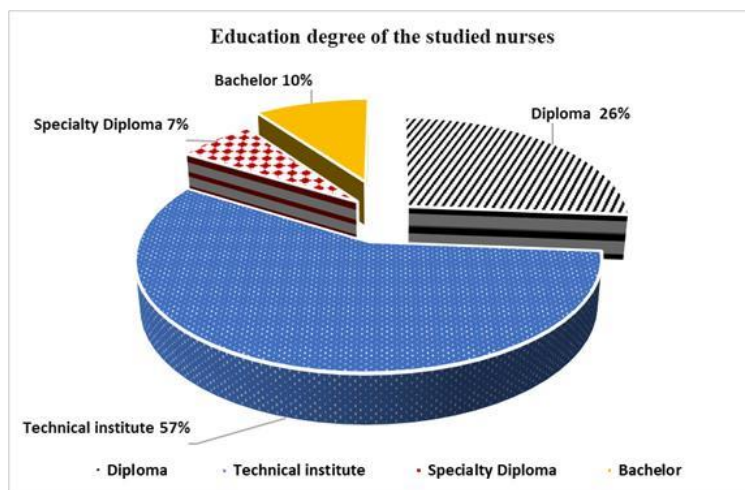


Table 2: Comparison Between the Studied Nurses' Level of Performance (Knowledge and Practice) Regarding Administering a Recurrent Large-Volume Cleansing Enema Throughout the Study Phases (n=61).

Items	Pre		Post		Follow-up		Comparison between		
	Satisfactory		Satisfactory		Satisfactory		Pre and Post	Pre and Follow-up	Pre, Post, and follow-up
	N	%	N	%	N	%			
1. The studied nurses' level of Knowledge									
a. Reviewing of hepatic encephalopathy	9	14.7	59	96.7	53	86.8	t=18.94 P=0.045*	t=17.11 P=0.001**	f=44.1 P=0.000**
b. Reviewing of the administering a recurrent large-volume cleansing enema	13	21.3	58	95.0	57	93	t=15.22 P=0.000**	t=13.37 P=0.000**	f=25.99 P=0.000**
c. Nursing role pre, during and post the administering a recurrent large-volume cleansing enema	11	18.0	60	98.3	56	91.8	t=14.76 P=0.000**	t=15.09 P=0.000**	f=49.9 P=0.000**
d. Interpretation of patient's output findings after the administering a recurrent large-volume cleansing enema	15	24.53	59	96.7	54	88.5	t=19.37 P=0.002**	t=14.71 P=0.000**	f=39.23 P=0.000**
2. The studied nurses' level of practice									
2.1. Administering a recurrent large-volume cleansing enema:									
a. Preparation pre the administering a recurrent large-volume cleansing enema	17	27.8	61	100	58	95.0	t=13.21 P=0.005**	t=14.65 P=0.001**	f=37.21 P=0.002**
b. Procedures during administering a recurrent large- volume cleansing enema	19	31.11	60	98.36	54	88.5	t=20.12 P=0.00*	t=18.91 P=0.001**	f=44.13 P=0.000**
c. Post administering a recurrent large-volume cleansing enema	14	22.9	58	95.0	56	91.8	t=21.47 P=0.000**	t=15.1 P=0.002**	f=42.01 P=0.000**
2.2. Assessment a level of consciousness:									
a. Eye opening response	23	37.7	61	100	59	96.7	t=11.01 P=0.001**	t=9.85 P=0.05**	f=22.21 P=0.05*
b. Verbal response	26	42.6	60	98.3	57	93.4	t=21.12 P=0.001*	t=19.81 P=0.076	f=42.15 P=0.002**
c. Motor response	15	24.5	59	96.7	55	90.1	t=32.45 P=0.003**	t=33.10 P=0.001**	f=41.31 P=0.000**
t: t. test f= Friedman test p= p-value *Significant: P≤0.05 **: Highly statistically significant at p ≤ 0.01.									

Figure 2. Comparisons Between the Nurses' Total Level of Performance (Knowledge and Practice) Regarding Administering a Recurrent Large-Volume Cleansing Enema Throughout the Study Phases (n = 61).

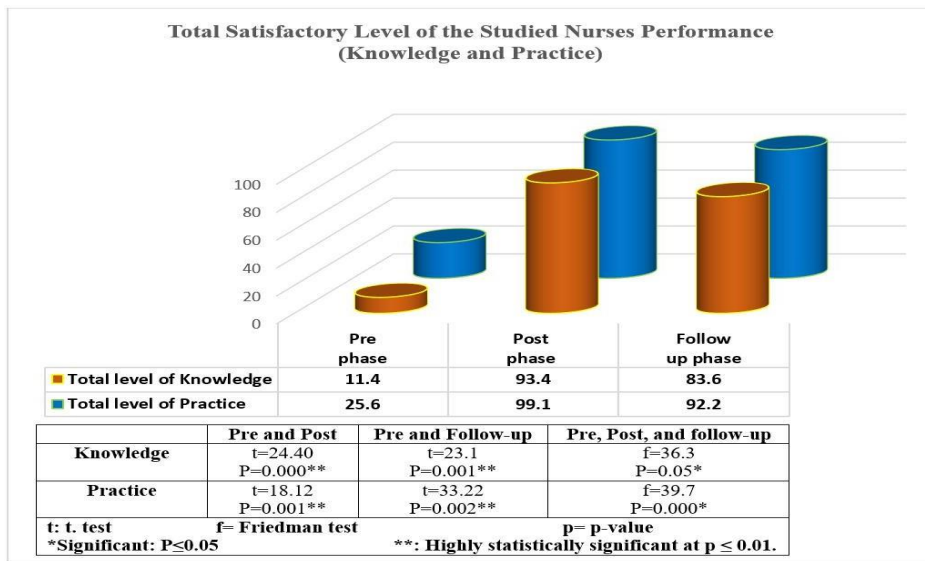


Table 3: Relation Between the Studied Nurses’ Total Level of Performance (Knowledge and Practice) and Demographic Characteristics of the Studied Nurses Regarding Administering a Recurrent Large-Volume Cleansing Enema Throughout the Study Phases (n=61).

Items		Satisfactory											
		Pre				Post				Follow-up			
		Level of Knowledge (n=7)		Level of Practice (n=16)		Level of Knowledge (n=57)		Level of Practice (n=60)		Level of Knowledge (n=51)		Level of Practice (n=56)	
		N	%	N	%	N	%	N	%	N	%	N	%
Age (year)	20-<30	4	57	11	69	45	79	50	83.3	43	85	49	87.5
	30-<40	2	29	3	19	11	19.3	8	13.3	6	13	7	12.5
	≥ 40	1	14	2	12	1	1.7	2	3.4	1	2	0	0
	X2	14.21		11.13		19.23		20.13		12.76		11.01	
	P- Value	0.02*		0.94		0.21		0.01*		0.000**		0.03*	
Gender	Male	2	28.5	5	31.25	19	33.3	13	21.7	13	25.5	7	12.5
	Female	5	71.5	11	68.75	42	73.7	47	78.3	38	74.5	49	87.5
	X2	12.32		21.21		2.41		5.89		2.13		2.41	
	P- Value	0.001**		0.05*		0.77		0.98		0.079		0.001*	
Marital status	Single	1	14.3	7	43.75	17	29.8	18	30	17	33.3	16	28.5
	Married	6	85.7	9	56.25	39	68.4	41	66.3	34	66.7	39	69.7
	Divorced	0	0	0	0	1	1.8	1	1.67	0	0	1	1.8
	X2	13.22		19.4		15.33		9.22		22.15		5.55	
	P- Value	0.87		0.01*		0.65		0.04*		0.098		0.01*	
Education degree	Diploma	1	14.3	2	12.5	13	22.8	15	25	12	23.5	14	25
	Technical institute	3	42.9	10	62.5	35	61.4	35	58.4	32	62.7	34	60.8
	Specialty diploma	1	14.3	1	6.3	3	5.3	4	6.6	2	3.9	3	5.3
	Bachelor	2	28.5	3	18.7	6	10.5	6	10.0	5	9.9	5	8.9
	X2	30.65		26.55		31.56		43.11		19.13		32.9	
	P- Value	0.001**		0.007**		0.004**		0.066**		0.003**		0.009**	
Nursing experience in the study setting (Year)	<5	5	71.4	8	50	32	56.2	32	53.4	27		31	55.5
	5-<10	1	14.3	5	31.3	20	35	21	35.0	19		20	35.8
	≥ 10	1	14.3	3	18.7	5	8.8	7	11.6	5		6	10.7
	X2	15.51		19.33		19.32		22.5		31.041		29.8	
	P- Value	0.000**		0.03*		0.003**		0.002**		0.001**		0.04*	
Receiving Training courses	Yes	7	100	9	56.2	17	29.9	23	38.3	16	31.4	16	28.6
	No	0	0.0	7	43.8	40	70.1	37	61.7	35	68.6	40	71.4
	X2	27.22		31.22		34.56		40.33		44.33		45.01	
	P- Value	0.003*		0.00*		.004**		0.002*		.000**		0.001*	
X2: A chi-square test		p= p-value											
*Significant: P≤0.05		** : Highly statistically significant at p ≤ 0.01.											

Table (4): Correlation Between Total Level of the Studied Nurses’ Knowledge and Their Total Level of Practices Regarding Administering a Recurrent Large-Volume Cleansing Enema Throughout the Study Phases (n=61).

Variables	Total level of knowledge	
	r	P
Total level of practice		
Pre- implementation of a nurse-led training program	0.321	0.003**
Post- implementation of a nurse-led training program	0.511	0.01*
Follow-up implementation of a nurse-led training program	0.641	0.001**
r: Pearson correlation coefficient	p= p-value	
*Significant: P≤0.05	** : Highly statistically significant at p ≤ 0.01.	

Discussion

Liver disease affects individuals worldwide. HE is a serious complication resulting from liver dysfunction that progresses rapidly (The American Association for the Study of Liver Diseases, 2022). Patients with

HE need nursing care both within the healthcare system and while at home (Hinkle & Cheever, 2018). Therefore, it is important for all nurses to acquire a basic knowledge of HE and its treatment. Administration of a large-volume cleansing enema is an early

intervention used to promote the patient's condition and allow for other collaborative treatments (**Liang et al., 2020**).

With regard to the studied nurses' characteristics, the majority were aged between 20–30 years with a mean age of 26.1 ± 3.32 years. This finding could be due to the fact that most of the nurses were recent graduates who tolerated the nature of their work in intensive care units. These findings are compatible with **Abo El Ata et al. (2021)** who found that more one third of the nurses in their study were less than thirty years old. However, this result is inconsistent with **Mohammed et al. (2021)** who reported that more than half of the studied nurses (53.3%) were older than thirty years.

With regard to the studied nurses' gender, the majority of them were female (80.3%) and more than half were married (54.1%). This could be because nursing is primarily a feminine profession in Egypt. In addition, male nurses prefer to travel abroad or work in private hospitals for higher pay, leaving governmental hospitals for female nurses. Egyptian culture also tends to promote early family building. These results are in agreement with **Atya et al. (2019)** who also found that most staff nurses are female and married.

Concerning the level of education, the current study showed that more than one third of the studied nurses received their education at a technical institute of nursing. This finding could be due to the fact that technical institutes of nursing supply the hospitals with more nurses than any degree program. The challenge now is to hire more nurses with a bachelor's degree for employment in critical care units. This finding is in agreement with the results of **Abd Elhaq (2018)** who also found that more than one third the studied nurses in a hepatic care unit had graduated from a technical institute. However, this finding is inconsistent with **Abo El Ata et al. (2021)** who reported that the majority of nurses in their study had a secondary nursing school certificate.

With respect to the studied nurses' experience in the study setting, the current findings showed that more than half of the nurses had experience less than or equal to five years. This result may be related to recent graduation, work burnout, the complexity of

the patient's condition, or an unplanned turnover of the nurses. All of these issues may interfere with a nurses' ability to maintain work continuity work in the unit. This finding is in agreement with **Hamed, Eldosokey, & Mohammed (2017)** who reported in their study that the majority of the studied nurses had one to five years of experience in their study setting.

With regard to previous training courses on the care of HE patients, the present findings demonstrated that approximately three quarters of the nurses did not receive training in this area. This may be because of staff shortages, work overload, a lack of qualified trainers, lack of a strategic training plan, or a shortage of available time. This result is supported by the findings of **Ferenci (2017)** who previously reported that the majority of nurses have not received training in administering a cleansing enema. This finding is also consistent with **Mohammed et al. (2021)** who found that there is little chance for nurses to participate in specific training programs to promote their performance.

The present study also showed that less than one quarter of the studied nurses possessed a satisfactory level knowledge prior to the implementation of the nurse-led training program. This may be related to a lack of time to update their training, an absence of this topic in education curricula, or an emphasis placed on nurses to develop practical skills rather than to improve knowledge. This finding is consistent with **Saad et al. (2021)** who revealed that more than one third of nurses in their study had an inadequate level of knowledge during the pre-phase of program implementation.

Following delivery of the nurse-led training program, there was a significant improvement in the nurses' level of knowledge. However, the level of knowledge was decreased slightly in the follow-up phase. This improvement implied that the training program was a successful in advancing the nurses' knowledge. This may be attributable to the effectiveness of the package materials, the use of simplified Arabic language, effective instructional media, or the nurses' motivation to acquire updated knowledge regarding the

administration of a recurrent large-volume cleansing enema for HE patients. This result is in line with **Mohammed et al. (2021)** who found that all of the respondent nurses had a satisfactory level of knowledge at the post phase. **Nasr, Ameen, Mohammed and Abd El Hafiz (2018)** also reported that the nurses in their study showed a significant improvement in the level of knowledge during the post phase.

Regarding the nurses' practices, the current study indicated that most of the studied nurses did not have a satisfactory level prior to implementation of the nurse-led training program. This may be attributed to the fact that the nurses felt that administering a large-volume cleansing enema in the hepatic care unit should be performed by nursing aids, that assessing the level of consciousness using the Glasgow Coma Scale is the responsibility of a physician, and that it is common for them to rely on the patient's relatives to administer a large-volume cleansing enema. This result is consistent with the findings of **Liang et al. (2020)** who reported that most nurses had an incompetent level of practice in the pre phase. In the same line, **Nasr et al. (2018)** reported a low level nurses' practice pre-program implementation.

Following implementation of the nurse-led training program, there was an improvement in the nurses' total level of practice in the post and follow-up phases, with significant differences between the pre/post, post/follow-up, and pre/follow-up phases of the training program. Thus, the nurse-led training program enhanced the nurses' knowledge of the care for HE patients which, in turn, promoted their practice. This result is consistent with the results of **Backhouse (2021)**, which showed that the more than two thirds of the studied nurses had a satisfactory level of practice in the post phase.

In addition, the present study showed that there was significant positive correlation between the nurses total knowledge scores and total practice scores throughout the study phases. These results could be related to the positive effect of the nurse-led training program, which may have helped nurses to improve their knowledge and their ability to

practice competently. This finding is in line with the study of **Alvarez-Gonzalez et al. (2020)** who showed that nurses had an adequate level of knowledge and practice following a training program compared to the pre phase, with a significant correlation throughout the study phases. However, this inconsistent with **Hamed (2017)** who reported that there was no significant correlation among the studied nurses between the total level of knowledge and practice.

Finally, based on the current results, it is clear that there were significant relationships between the nurses' level of knowledge, practice, and their demographic characteristics for educational level, years of experience, and training courses throughout the phases of the study. This may be due to the nurses who had a higher educational degree and more experience, and to receiving a specific training course on administering a large-volume cleansing enema that had beneficial effects on level of knowledge and the competence of delivered clinical practice. This finding is consistent with **Saad et al. (2021)** who found that demographic variables were significantly associated with the level of nurses' performance in the pretest and posttest phases.

Conclusion

Based on the findings of this study, it can be concluded that the implementation of a nurse-led training program enhanced the nurses' knowledge and practice scores. As well, there was significant improvement in the nurses' performance throughout three phases (pre/post and follow-up) of the nurse-led training program. However, there were significant relationships between educational level, years of experience, and training courses, and total knowledge, and practice scores, throughout phases of implementing the nurse-led training program on the administering a recurrent large-volume cleansing enema.

Recommendations

Considering the current findings, several recommendations may be put forth. First, it is necessary to implement nurse-led training programs in a wider setting at hospitals to promote the efficacy of nursing care. A periodic refresher training program should be

designed for critical care nurses on administering a recurrent large-volume cleansing enema in order to enhance their performance and subsequently improve the outcome of delivered care. Hepatic care units must also be provided with more Arabic copies of training programs to supply nurses with an understandable guide. In addition, to establish the generalization of these findings, further research should be conducted in other settings on a larger sample to examine the effectiveness of the designed program.

Limitations of the study:

Unintended dropout of four nurses because of varied conditions as recent pregnancy, turnover or absenteeism from the study setting.

Author Contributions in the study:

All the researchers made substantial contributions to data gathering, processing, and interpretation. ME and FE had complete access to all data and are entirely responsible for the accuracy of the data analysis. ME, BS, and FE wrote the manuscript, and they all contributed significantly to its critical revision and submission to journal.

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Conflict of interest:

It stated plainly that there was no conflict of interest.

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