Effect of Implementing Nursing Measures about Hypoxemia for Critically Ill Patients Suffering from Ascites at Medical Intensive Care Unit

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Abstract

Background: Intensive care unit patients who have been admitted are susceptible to hypoxemia associated with hepatic diseases and ascites. Hypoxemia should be detected at an early stage to prevent serious consequences. **Aim:** Assess the effect of the implementation nursing measures about hypoxemia for critically ill patients suffering from ascites at medical intensive care unit. **Design:** An experimental quasi-design. **Setting:** This study was performed at the Medical Intensive Care Unit at Tanta Main University Hospital. **Subjects:** Purposive sampling of 80 adult patients with hypoxemia and meeting all inclusion criteria were separated into two equal groups, with each group including 40 patients. **Tools:** Three tools were used in the process of data collecting. **Tool (I):** Critically Ill Hepatic Patients Assessment Tool**. Tool (II)**: Hypoxemia Indicators Assessment Tool. **Tool (III)**: The Ascites Symptom Inventory-7 for (ASI-7) Scale Assessment. **Result:** The main results revealed an improvement in relation to physiological parameters, respiratory assessment in study than control group, significant difference between patients in the study group regarding body temperature with P=0.000. Statistically significant difference was observed related to oxygen saturation, dyspnea and chest pain assessment among the control and study group with P=0.000. **Conclusion:** Nursing measures had a positive effect on decreasing hypoxemia by improving oxygen saturation, physiological parameters and reducing dyspnea, chest pain. **Recommendation:** Data generalizability via replication of the same research using a bigger probability sample in other geographic regions.

Key words: - Ascites, Critical ill patient, Hypoxemia, Nursing measures.

Introduction

Liver failure is an urgent medical issue that poses a danger to life. Frequently, liver failure develops gradually over an extended period of time. It's the final stage of many liver diseases. On the other hand, acute liver failure is an uncommon illness that may manifest within just 48 hours and may initially be challenging to diagnose. Liver failure transpires when significant portions of the liver sustain irreparable damage, rendering it incapable of performance. **(Ganger et al., 2018)**.

Globally, liver cirrhosis ranks eleventh in terms of the most frequent causes of mortality. Liver disease accounts for two

million deaths annually and is responsible for 4% of 1 out of every 25 fatalities on a global scale **(Devarbhavi et al., 2023)**. Chronic liver disease usually progresses to cirrhosis. The most common causes of cirrhosis include hepatitis C, alcoholic liver disease, cryptogenic causes, hepatitis B, and other miscellaneous causes (autoimmune hepatitis, primary biliary cholangitis, Wilson disease) **(Ramachandran et al.,2019)**.

Cirrhosis of the liver may cause a reasonable amount of asymptomatic people to have a life expectancy that is considered normal. Others have a diminished prognosis for survival and a variety of the most severe symptoms of end-stage liver disease. Hepatomegaly, stomach discomfort, ascites, abdominal distention, bulging flanks, changing dullness, anorexia, weight loss, weariness, and muscle atrophy are all potential indications and symptoms. **(Adhyatm et al., 2022)**.

Ascites, which refers to the collection of fluid inside the peritoneal cavity, manifests in sixty percent of patients diagnosed with decompensated liver cirrhosis within a decade as the illness progresses naturally. Presently, it remains a prevalent issue in people afflicted with liver cirrhosis, cancer, or cardiovascular disease. Liver cirrhosis accounts for 75–85 percent of all cases of ascites **(Banini et al., 2020)**. It is the most prevalent complication seen in cirrhotic liver patients. Numerous life-threatening problems may ensue, ultimately culminating in an unfavourable prognosis for long-term survival.

Within three years, the incidence of ascites is estimated to be about 75,000 per 100,000 cirrhotic people, accompanied by a 50% death rate **(Devarbhavi et al., 2023)**. Complications like hepatorenal syndrome and spontaneous bacterial peritonitis contribute to an increase in mortality. Additionally, ascites induces basilar atelectasis, which adds to dyspnea and hypoxemia, and raises the diaphragms. **(Ramachandran et al.,2019)**.

A multitude of lung disorders manifest in conjunction with hepatic pathology. In addition to elevating the diaphragms, ascites induces basilar atelectasis, a condition that worsens dyspnea and hypoxemia. Certain ascites patients have diaphragmatic abnormalities that let ascites fluid to enter the thoracic cavity, resulting in a hydrothorax, which is a pleural effusion **(Banini et al., 2020)**.

Hypoxemia is characterized by an arterial blood oxygen partial pressure (PaO2) below 80 mm Hg, which is equivalent to a saturation of 95%. Hypoxemia has been seen in around one-third of chronic liver disease patients **(Banini et al., 2020)**.

A variety of factors contribute to hypoxemia in people with chronic liver disease. Significant contributors to hypoxemia and chronic liver disease in a patient include hepatopulmonary syndrome and chronic liver disease, respectively. The occurrence of this complication in individuals with chronic liver disease signifies an unfavourable prognosis. **(Adhyatm et al., 2022)**.

As the body cannot operate properly in the absence of sufficient oxygen in the blood, untreated hypoxemia may result in further difficulties, including brain damage and death, heart problems, lung troubles, and renal problems. **(Ganger et al., 2018)**.

The role of critical care nurse in case of hypoxemia, gives the patient adequate supply of oxygen. Observe for changes in behavior and evaluate skin for the onset of cyanosis,

provide supplement via 100% O_2 non rebreathe mask, prepare the patient for intubation, assess for signs of hypoxemia, and install a continuous pulse oximeter on the patient and situate the head of the bed at a 45-degree angle. **(Odriscoll et al.,2017)**.

The nurse should also pace activities, provide rest moments, and support patients with coughing and deep breathing methods in order to reduce fatigue, chest pain and dyspnea**.** An essential responsibility of the nurse is to evaluate for preliminary indications of hypoxemia and determine if supplementary oxygen is required. Delaying oxygen delivery due to the need for a medical order, on the other hand, might have a substantial impact on the patient's prognosis. **(Wang et al., 2021).**

Significance of the study

Individuals who are hospitalized to Medical Intensive Care Units are vulnerable to hypoxemia that is caused by ascites and hepatic disorders. Ascites related to liver failure will lead to cirrhosis is linked to a range of pulmonary problems, including dyspnea, atelectasis, diaphragmatic excursion limitation, pulmonary hypertension, hepatopulmonary complications, hypoxemia, pleural effusions, and pneumonia. Hypoxemia may occur resulting in chest pain and dyspnea**.** So, the nurses should be good orientated about what the mean of hypoxemia, signs and symptoms, causes and nursing role for patients with hypoxemia **(Wang et al., 2021)**. The objective of this research was to assess the impact of nurse implementation measures about hypoxemia for critically ill patients suffering from ascites at the medical intensive care unit.

Purpose of the study: to evaluate the effect of implementing nursing measures about hypoxemia for critically ill patients suffering from ascites at Medical Intensive Care Unit.

Research hypothesis:

The cohort of patients who were administered nursing interventions to decrease hypoxemia was exhibited early detection of hypoxemia and its complications, decreasing severity of hypoxemia, dyspnea and chest pain compared to control group who does not received.

Subjects and method:

Study design: Utilizing a quasi-experimental research approach, this investigation was carried out.

Study setting:

The research was carried out in the Medical ICU located at Tanta Main University Hospital. They consisted of three rooms, with each room accommodating a total of six beds.

Study subjects:

Purposive sampling of 80 patients divided into two groups of 40 in each in the above previously mentioned settings. The Epi-Info 7 Statistical Program was used for calculating sample size and power analysis, using the following parameters: Total patients is 250 per year, there is 99.9% confidence, and 50% expected frequency, 5% acceptable error and a 95% confidence rate.

-Inclusion criteria of selection of subjects; Adult patients aged 21 to 60 years, both sex and newly admitted patients, patients with hepatic disease, moderate, sever ascites and oxygen saturation <95%.

Tools of data collection

Three instruments were used to gather patient information:

Tool (I): Critically Ill Hepatic Patients Assessment Tool:

It was developed by the researcher after reviewing of literature **Fabrellas N et al (2020)** to collect data pertinent to the current study. It consisted of three parts·

Part (a): Patients' Bio-demographic Characteristics: This part was used to cover patient's age, gender, diagnosis, weight, past and present medical history, medication history and measuring abdominal circumference.

Part (b): Physiological Parameters Assessment: It was used to assess patient's heart rate, body temperature, breathing, and blood pressure are examples of vital indicators.

Part (c): Respiratory Assessment (Ernstmeyer & Christman,2021): It was used to assess breathing pattern, rate, depth, rhythm and abnormalities, skin color for development of cyanosis and assess for use of accessory muscle, site, character, radiation of chest pain and oxygen saturation.

Classification	PaO2 (mmhg)	SaO2
Normal	800-100	>95
Mild hypoxemia	60-79	90-94
Moderate hypoxemia	40-59	75-89
Severe hypoxemia	<40	<75

Classification of Hypoxemia and Oxygen Saturation Level

Tool (II): Hypoxemia Indicators Assessment Tool

It was used to assess the presence of hypoxemia**.** It consisted of two parts**:**

Part (a): Numerical Rating Scale for Chest Pain Assessment: This part was developed by **Boonstra A et al (2016)** and adopted by **Nugent S et al (2021)** to measure severity of chest pain. The intensity of pain experienced by a patient spans the spectrum from no discomfort at all to intense agony. The patient indicates on this scale, which is typically a 10-centimeter-long horizontal line, the point that best reflects their impression of their present condition. The score is calculated by measuring the point where the patient makes an indentation in millimeters.

Scoring system:

- Score (0) No discomfort, mild chest pain (scoring 1–3), moderate chest pain (scoring 4–6), or severe chest pain (scoring 7–10).

Part (b): Numerical Rating Scale for Dyspnea Assessment:

This part was developed by **Wysham N et al (2015)** and adopted by **stevens J et al (2019)** to measure severity of dyspnea. The rating scale consists of ten items. A score of zero indicates normal breathing (lack of dyspnea), while a score of ten signifies the subject's highest potential perception of dyspnea.

Scoring system:

Score (0) none, score from (1-4) mild dyspnea, score from (5-6) moderate dyspnea and score from (7-10) sever dyspnea.

Tool III: The Ascites Symptom Inventory-7 (ASI-7) Scale Assessment:

This tool was developed by **Neijenhuis M et al (2018)** and adopted by **Kawaratani H et al (2021)** The ASI-7 was used to evaluate the severity of ascites on days 1 and 7 of the trial. Seven items were presented on a five-point Likert scale: The following applies: 0 is not applicable; 1, is only slightly applicable; 2, is somewhat applicable; 3, is strongly applicable; and 4, is very strongly applicable. A progression from moderate to severe symptoms was applied to the seven criteria to facilitate clinical interpretation. The total of the scores for each of the seven components (0–4 points) was used to get the cumulative score, which has a possible range of 0 to 28 points. The ASI-7 scoring system exhibited

an uneven distribution over the whole range of 0 to 28 points.

Scoring system:

1) Slight ascites (0-11); 2) Mild ascites (12-18); 3) Moderate ascites (19-22); and 4) Severe ascites comprised the ASI-7 scoring system (23-28).

Method

The following steps were taken to complete the study.

1- Obtaining approval

Prior to commencing the research, official authorization was sought from the dean of the Faculty of Nursing and the administrators of the Medical ICU at Tanta University Hospital. This authorization was granted to enable the researcher is required to gather data at the specified site.

2- Ethical and legal considerations

a. Ethical committee approval was acquired from the Faculty of Nursing Tanta University before conducting the study with code No 2022-12-168.
b. The core of the research did not induce any discomfort to any of the participants.
c. Each cognizant patient provided informed permission, and if unconscious, one of the patient's family members did so on their behalf, after a comprehensive explanation of the study's objectives and the patient's right to withdraw from the research at any time.
d. The preservation of patient privacy and confidentiality was a primary concern throughout the data gathering process. A code number that is substituted for names.

3- Tools development

This study used three instruments, the first of which was produced by the researcher after a review of pertinent literature. Tool (II) was developed by **Boonstra A et al (2016)** for part I and **Wysham N et al (2015)** for part II. Tool (III) was developed by **Neijenhuis M et al (2018)**.

4- Pilot study:

A pilot study was performed on 10 percent of the study sample in order to assess the tools' practicability and applicability, as well as to identify any potential obstacles that might arise during data collection. Any necessary adjustments were made, and the pilot study participants were excluded from the main study.

5- Content validity of the tools:

A panel of five specialists specializing in critical care and emergency nursing, as well as doctors, evaluated the clarity and content validity of each instrument prior to its presentation to the jury.

6- Reliability of the tools

Tool (I) was tested for reliability using Crombach's α coefficient test and it was 0.89. Also, the reliability of tool II was 0.95 and 0.96 for tool III.

7- Data collection

The gathering of data for the current research spanned the time period commencing in early March 2023 and concluding in August 2023.

8- Phases of the study

1-Assessment phase: -

An evaluation of the patient's first data was conducted for both groups by using tool I: critically ill hepatic patients' assessment tool had three components. Part (a); Patients' Bio-demographic variables such as age and gender, diagnosis and abdominal circumference), part (b); physiological parameters assessment to assess (vital signs: breathing, heart rate, body temperature, and blood pressure) and Part (c); respiratory assessment to assess (Breathing pattern, skin

color for development of cyanosis , assess for use of accessory muscle, assess site, character, radiation of chest pain and oxygen saturation) ,tool II: hypoxemia indicators assessment tool it consisted of two parts. Part (a) numerical rating scale for chest pain assessment to assess severity of chest pain and Part (b) numerical rating scale for dyspnea assessment to assess severity of dyspnea and tool III: (ASI-7) is the Ascites Symptom Inventory-7 scale assessment to assess severity of ascites by the researcher for both the control and study groups promptly implement evidence-based nursing recommendations upon admission.

2- Planning phase: -

This phase was based on data of the assessment phase and expected outcomes criteria that was prescribed when planning patient care.

Expected outcomes:

1. Reduce hypoxia.
2. Maintain normal physiological parameters.
3. Decrease severity of chest pain and dyspnea.

3-Implementation phase: -

For control group:

The patient was given their regular critical care unit nursing care by medical intensive care nurses as administration of oxygen therapy according to physician order, maintain patient in fowler position and attach patient with pulse oximeter.

For study group:

Nursing measures were implemented by the researcher throughout two weeks during morning and afternoon shifts, while at the night shift it was applied by the critical care nurses at the Medical Intensive Care Unit after they were trained by the researcher. The nursing measures that applied by the researcher were started immediately on admission.

Nursing measures included the following:

1. **Assessment of patient with hypoxemia (Lippincott, 2018).**

- Maintaining measurement of vital signs (breathing, heart rate, body temperature, and blood pressure).
- Lips, nail and skin color for development of cyanosis was assessed.
- Patient was attached with continuous pulse oximeter.
- Rapid monitoring of oxygen by pulse oximeter.
- Arterial blood gases (ABG) levels was assessed.
- Patient was attached with cardiac monitor.

2. **Maintain patient on bed rest on high fowler position to decrease dyspnea (Lippincott, 2018).**
3. **Providing supplemental oxygen at 2 to 4 L/min (Odriscoll et al.,2017)**.

- Instruct the patient to take deep breathing.
- High flow rate and high concentration of oxygen according to doctor order was administered.
- Humidify oxygen.
- Oxygen through (nasal cannula, face mask) was administered.

4. **Chest physiotherapy (Chen et al.,2022), it includes:**

A-Deep breathing technique (Yosi & Hendri, 2023).

- Put patient in a comfortable position.
- Patient was instructed to keep chest and shoulders relaxed.
- The patient was inhaled slowly and deeply breath through the nostrils, feeling the chest expand fully, while expanding the lower rib cage and allowing the abdomen (belly) to advance.

- Exhale for three to five seconds.
- Does not force the lung to empty completely.
- Exhale thoroughly and gently through pursed lips.
- Take 10 deep breaths every hour.
- Rests between breaths for about 1 to 2 seconds.

B- Coughing exercise (Yosi & Hendri, 2023).

- Position the patient in a comfortable manner.
- Relax by taking a few deep breaths.
- As the patient inhales deeply through the nose, the chest expands completely.
- Exhale for three to five seconds.
- Cough vigorously and concentrate on expelling every last drop of air from the chest.
- Tissue paper was used to remove any oral mucous.
- The coughing exercise was performed many times until no mucus was expelled.

5. Assessment of chest pain (Castarlenas et al.,2017).

- Assessing for presence of pain (site, location, onset, character and intensity)
- Pain was evaluated both at rest and during motion.
- Put patient in a comfortable position.
- Severity of pain was assessed by using numerical scale.
- Pain reassessed after interventions given.

6. Assessment and management of dyspnea (Stevens et al., 2019).

- Respiratory rate and depth was assessed and recorded.
- Arterial blood gases (ABG) levels was assessed.
- Breath sounds was auscultated at least every 2 hours.
- Severity of dyspnea by using numerical scale was assessed.
- Put patient in a comfortable position.
- Good ventilation should be maintained.
- Oxygen therapy was administrated.
- Patient was attached with pulse oximeter.
- Severity of dyspnea reassessed by using numerical scale.

7. Scheduling nursing care activities (Ernstmeyer, K., & Christman, 2021).

Patient take rest between nursing activities which include (vital signs, medication administration, nutrition, assessment chest pain, dyspnea and chest physiotherapy techniques).

4- Evaluation phase: -

Patients of both groups were evaluated at Medical Intensive Care Unit three time; at 1st, 3rd and at 7th day of interventions using the three mentioned tools. Tool I: critically ill hepatic patients' assessment tool, it was used to evaluate patients' demographic features, physiological parameters and respiratory assessment, tool II; hypoxemia indicators assessment tool it was used to assess severity of chest pain and dyspnea and tool III; The Ascites Symptom Inventory-7 (ASI-7) Scale Assessment. It was used to assess severity of ascites expect tool I part (a).

A comparative analysis was conducted between the two groups in order to assess the impact of hypoxemia-related nursing interventions for critically sick patients presenting with ascites in a medical intensive care unit.

Results

Table (1): Distribution of critically ill hepatic patients regarding their socio-demographic characteristics.

Regarding age, this table revealed that near two third (60.00%) of both group aged from

(50-60) years. In relation to gender, more than half of patients in control and study group (52.50% and 57.50%) were male respectively. Also, the mean of abdominal circumference in both control & study group were (111.95±18.49) & (126.23±9.95) respectively. Regarding weight, it was found that the means of body weight of both control & study group were (75.23±9.83, 84.53±14.88) respectively. Also the mean height of both control and study group were (168.83±5.96, 172.63±5.15) respectively.

Table (2): Shows distribution of the critically ill hepatic patients regarding their clinical data.

In relation to past medical history, more than one third (35.00% and 37.50%) of patients in control and study group had diabetes mellitus respectively. Also, the same percent (17.50%) of both group had renal disease. Regarding past surgical history, equal patients of control and study group (30.00%) hadn't past surgical history. Also, the same percent (2.50%) of both group had hysterectomy. As regard medication history, it was noticed that more than two third (70.00%) of patients in control group and the majority (75.00%) of patients in study group had diuretics.

Table (3): Shows mean scores of physiological parameters of the critically ill hepatic patients throughout periods of intervention.

Regarding vital signs this table showed that, there was an improvement in respiratory rate in study group than control group specially in 2nd week with a mean (18.13±2.68 and 19.38±4.04) respectively. In relation to heart rate , there was an improvement in heart rate in study group than control group specially in 2nd week with a mean score (80.18±12.85 and 90.33±17.67) respectively. Moreover, there was an improvement in body temperature in study group than control group especially in 2nd week (37.28±0.21 and 37.65±2.89) respectively. Finally, statistical significance difference was observed among study group regarding their body temperature as p value = (0.000).

Table (4): Presents distribution of the critically ill hepatic patients regarding their respiratory assessment throughout periods of intervention.

Regarding depth of respiration, more than two third (72.50%) of patients in study group had normal depth of respiratory rate especially in 2nd week. While one quarter (25.00%) of patients in control group had normal depth with statistical significance difference among both group with p value = (0.00) (76.555 and 20.184) respectively. Regarding rhythm of respiration, an improvement in study group than control group especially in 2nd week was observed. Nearly total patients (97.50%) in study group and the majority (75.00 %) of patients in control group had regular rhythm respectively with statistical significance difference while p was (0.000 & 0.007) at the end of 1st week & at the end of 2nd week respectively. In relation to use accessory muscle, there was an improvement in study group than control group specially in 2nd week as, the majority of patients (92.50%) didn't use accessory muscle. statistical significance difference was observed while p value = (0.001).

Regarding skin color, no statistical significant difference was observed among both study control group throughout all period of study. On the other hand, statistical significant difference was observed among

study &control group only on admission with p = 0.044.

Table (5): Distribution of the critically ill hepatic patients regarding their chest pain characters throughout periods of intervention.

In this table regarding of chest pain , an improvement in study group than control group specially in 2nd week was observed as more than two third (77.50%) of patients in study group hadn't chest pain and less than one quarter (22.50 %) of patients in control group hadn't chest pain . There were statistical significance differences among study and control group throughout periods of study with p= (0.000 & 0.011) respectively.

Table (6): Distribution of the critically ill hepatic patients regarding numerical rating scale (NRS) for chest pain throughout periods of intervention. In study group, about half (47.50%) of sample had moderate chest pain on admission compared to only (2.50%) of the patients at 2nd week with p= (0.000). In control group, more than half (57.50%) of sample had moderate chest pain on admission compared to less than one third (30.00%) of the patients at 2nd week with p value = (0.006). Also, there were an improvement in study group than control group especially in 2nd week while, the majority (77.50 %) of patients in study group hadn't chest pain. There were statistical significance differences among study group and control group (79.569 and 18.245) with p value = (0.000 and 0.006) respectively.

Statistical significant difference were observed among control group throughout their periods of the study while p=0.006. Also, p value of study group was 0.000. On the other hand statistical significant difference were observed between control study group at 1st week &2nd week where p=0.000.

Table (7): Distribution of the critically ill hepatic patients regarding the assessment of numerical rating scale (NRS) for dyspnea throughout periods of intervention.

In study group, two third (65.00%) of sample had moderate dyspnea on admission compared to only (5.00%) of the patients at 2nd week with p= (0.000). In control group it was observed that, majority (72.50%) of sample had moderate dyspnea on admission compared to more than one third (40.00%) of the patients at 2nd week with p value = (0.000). Also, there was an improvement in study group than control group especially in 2nd week. While, about two third (65.00 %) of patients in study group hadn't dyspnea .There were statistical significance difference among study group and control group with p value = (0.000). Moreover, the mean score of dyspnea at the end of 2nd week among study group was (0.73±1.26) compared to (3.20±2.38) to control group.

Table (8): Distribution of the critically ill hepatic patients regarding their ascites symptom inventory scale throughout periods of intervention.

Regarding ascites, on admission more than half (52.50%) of control group and majority (87.50%) of study group had sever ascites. Also, there was an improvement in 2nd week as less than half (45.00%) of control group had mild ascites while nearly one third (30.00%) of study group had slight ascites. Statistical significance difference was observed throughout period

of study among both study & control group where p value = (0.000).

Table (9): Correlation between total score of NRS for chest and dyspnea of the critically ill hepatic patients and ascites symptom inventory throughout periods of intervention.

In this table, in control group, positive and highly significant correlation was observed between numerical rating scale for chest pain and ascites symptom inventory scale on admission and in 2nd week where r & p = (0.444, 0.004) and (0.572 , 0.000) respectively. Also, highly significant & positive correlation was observed on admission and in 2nd week between numerical rating scale for dyspnea and ascites symptom inventory scale where r & p= (0.411, 0.009) and (0.593, 0.000) respectively.

For study group, positive and highly significant correlation was observed between numerical rating scale for chest pain and ascites symptom inventory scale on admission and in 2nd week where & p =(0.372,0.018) and (0.400,0.010) respectively . Also, highly significant & positive correlation was observed on admission and in 2nd week between numerical rating scale for dyspnea and ascites symptom inventory scale where r& p= (0.411, 0.008) and (0.463,0.003) respectively.

Table (1): Distribution of critically ill hepatic patients regarding demographic characteristics.

Characteristics	The studied hepatic patients (n=80)				χ^2 P
	Control group (n=40)		Study group (n=40)		
	N	%	N	%	
Age (in years)					
▪ (21-<30)	6	15.00	2	5.00	
▪ (30-<40)	4	10.00	5	12.50	2.711
▪ (40-<50)	6	15.00	9	22.50	0.438
▪ (50-60)	24	60.00	24	60.00	
Range Mean ± SD	(21-60) 47.33±12.76		(22-60) 49.58±9.73		t=0.888 P=0.377
Gender					
▪ Male	21	52.50	23	57.50	FE
▪ Female	19	47.50	17	42.50	0.822
Weight (in Kg) Range Mean ± SD	(55-92) 75.23±9.83		(60-125) 84.53±14.88		t=2.296 P=0.439
Height (in cm) Range Mean ± SD	(155-183) 168.83±5.96		(165-183) 172.63±5.15		t=2.049 P=0.441
Abdominal circumference (in cm) Range Mean ± SD	(10-132) 111.95±18.49		(109-149) 126.23±9.95		t=1.298 P=0.501

Table (2): Distribution of the studied critically ill hepatic patients regarding their clinical data

Clinical data	The studied hepatic patients				χ^2 P
	Control group (n=40)		Study group (n=40)		
	N	%	N	%	
# Past medical history					
▪ Respiratory diseases	7	17.50	9	22.50	
▪ Heart diseases	11	27.50	6	15.00	
▪ Renal diseases	7	17.50	7	17.50	0.295
▪ Cancer	4	10.00	13	32.50	0.587
▪ Hepatic disease	40	100.00	40	100.00	
▪ Diabetes Mellitus	14	35.00	15	37.50	
# Past surgical history					
▪ None	12	30.00	12	30.00	
▪ Appendectomy	5	12.50	4	10.00	
▪ Thyroidectomy	2	5.00	3	7.50	3.948
▪ Hemorrhoids / anal fissure	4	10.00	7	17.50	0.267
▪ Hysterectomy	1	2.50	1	2.50	
▪ Cholecystectomy	12	30.00	7	17.50	
▪ Hernia	9	22.50	6	15.00	
# Medication history					
▪ Beta blocker	9	22.50	6	15.00	
▪ Antibiotics	29	72.50	23	57.50	
▪ Anticoagulants	13	32.50	9	22.50	2.572
▪ Diuretics	28	70.00	30	75.00	0.109
▪ Analgesics	27	67.50	29	72.50	
▪ Corticosteroid	13	32.50	5	12.50	

More than one answer was chosen

Table (3): Mean scores of physiological parameters of the studied critically ill hepatic patients throughout periods of intervention.

Vital signs	The studied hepatic patients (n=80) Range Mean ± SD							
	Control group (n=40)			F P	Study group (n=40)			F P
	On admission	At the end of 1st week	At the end of 2nd week		On admission	At the end of 1st week	At the end of 2nd week	
1. Respiratory rate	(10-30) 20.65±7.05	(10-28) 19.95±5.33	(10-25) 19.38±4.04	0.517 0.598	(11-27) 17.23±5.60	(12-25) 17.05±4.13	(13-23) 18.13±2.68	0.719 0.489
2. Heart rate (HR)	(55-125) 96.78±22.96	(59-120) 93.38±20.01	(60-120) 90.33±17.67	1.007 0.368	(60-120) 84.65±19.11	(60-110) 81.48±15.69	(60-100) 80.18±12.85	0.819 0.443
3. Blood pressure ▪ Systolic	(80-150) 120.75±23.57	(80-150) 119.25±22.82	(80-140) 117.00±20.78	0.284 0.754	(80-140) 115.50±21.72	(80-150) 115.00±20.00	(90-140) 115.00±14.85	0.009 0.991
▪ Diastolic	(40-100) 81.25±16.97	(50-100) 78.75±14.88	(50-90) 76.00±13.92	1.176 0.312	(50-90) 75.00±13.59	(50-100) 74.50±13.77	(60-90) 74.50±9.86	0.021 0.979
4. Body temperature	(37.2-38.7) 37.89±0.39	(37.1-38.5) 37.66±0.32	(37.0-37.2) 37.65±2.89	0.933 0.396	(37.3-38.1) 37.74±0.22	(37.0-37.7) 37.45±0.17	(37.0-37.6) 37.28±0.21	**68.104 0.000***

* Significant at level P<0.05.

Table (4): Distribution of the critically ill hepatic patients regarding respiratory assessment throughout periods of intervention.

Respiratory assessment	The studied hepatic patients (n=80)													
	Control group (n=40)							Study group (n=40)						
	On admission		At the end of 1st week		At the end of 2nd week		χ^2 P	On admission		At the end of 1st week		At the end of 2nd week		χ^2 P
	N	%	N	%	N	%		N	%	N	%	N	%	
Depth														
▪ Normal	0	0.00	1	2.50	10	25.00	**20.184**	0	0.00	0	0.00	29	72.50	**76.555**
▪ Shallow	23	57.50	20	50.00	12	30.00	**0.000***	17	42.50	17	42.50	4	10.00	**0.000***
▪ Deep	17	42.50	19	47.50	18	45.00		23	57.50	23	57.50	7	17.50	
Gp1 Vs Gp2 χ^2 , P	FE , 0.263		1.624 , 0.444		**18.096 , 0.000***									
Rhythm														
▪ Regular	0	0.00	11	27.50	30	75.00	**51.201**	0	0.00	28	70.00	39	97.50	**81.983**
▪ Irregular	40	100.00	29	72.50	10	25.00	**0.000***	40	100.00	12	30.00	1	2.50	**0.000***
Gp1 Vs Gp2 χ^2 , P	-		**FE , 0.000***		**FE , 0.007***									
Skin color														
▪ Pallor	12	30.00	12	30.00	12	30.00		7	17.50	7	17.50	7	17.50	
▪ Jaundice	23	57.50	25	62.50	27	67.50	4.070	33	82.50	33	82.50	33	82.50	0.00
▪ Cyanosis	4	10.00	3	7.50	1	2.50	0.667	0	0.00	0	0.00	0	0.00	1.00
▪ Flushed	1	2.50	0	0.00	0	0.00		0	0.00	0	0.00	0	0.00	
Gp1 Vs Gp2 χ^2 , P	**8.102 , 0.044***		5.419 , 0.067		2.916 , 0.233									
Use accessory muscle														
▪ Yes	30	75.00	22	55.00	17	42.50	**8.798**	40	100.00	23	57.50	3	7.50	**69.293**
▪ No	10	25.00	18	45.00	23	57.50	**0.012***	0	0.00	17	42.50	37	92.50	**0.000***
Gp1 Vs Gp2 χ^2 , P	**FE , 0.001***		FE , 1.00		**FE , 0.001***									

*Significant at level P<0.05

Table (5): Distribution of the studied critically ill hepatic patients regarding characters of chest pain characters throughout periods of intervention.

Chest pain	The studied hepatic patients (n=80)													
	Control group (n=40)							Study group (n=40)						
	On admission		At the end of 1st week		At the end of 2nd week		χ^2 P	On admission		At the end of 1st week		At the end of 2nd week		χ^2 P
	N	%	N	%	N	%		N	%	N	%	N	%	
▪ None	0	0.00	2	5.00	9	22.50		0	0.00	7	17.50	31	77.50	
▪ Upper chest	15	37.50	14	35.00	13	32.50		15	37.50	12	30.00	5	12.50	
▪ Substernal	4	10.00	4	10.00	2	5.00		2	5.00	2	5.00	1	2.50	
▪ Sternum	2	5.00	2	5.00	2	5.00	**14.139**	1	2.50	1	2.50	0	0.00	**63.001**
▪ Retrosternal	3	7.50	3	7.50	2	5.00	**0.011***	11	27.50	11	27.50	2	5.00	**0.000***
▪ Epigastric	13	32.50	12	30.00	9	22.50		10	25.00	6	15.00	1	2.50	
▪ Intrascapular	3	7.50	3	7.50	3	7.50		1	2.50	1	2.50	0	0.00	
Character of chest pain	**(n=40)**		**(n=38)**		**(n=31)**			**(n=40)**		**(n=33)**		**(n=9)**		
	18	45.00	18	47.37	15	48.39		14	35.00	14	42.42	4	44.44	
▪ Pressure	7	17.50	7	18.42	7	22.58		8	20.00	8	24.24	2	22.22	
▪ Fullness	1	2.50	1	2.63	1	3.23		0	0.00	0	0.00	0	0.00	
▪ Burning	7	17.50	7	18.42	6	19.35	0.191	4	10.00	4	12.12	1	11.11	0.718
▪ Tightness	7	17.50	5	13.16	2	6.45	1.00	14	35.00	7	21.21	2	22.22	0.994
▪ Crushing	5	12.50	14	35.00	13	32.50		9	22.50	32	80.00	12	30.00	
	30	75.00	24	60.00	16	40.00		26	65.00	8	20.00	2	5.00	
	5	12.50	2	5.00	3	7.50		5	12.50	0	0.00	0	0.00	

* Significant at level P<0.05

Table (6): Distribution of the critically ill hepatic patients regarding numeric rating scale (NRS) for chest pain throughout periods of intervention.

NRS for chest pain	The studied hepatic patients (n=80)													
	Control group (n=40)							Study group (n=40)						
	On admission		At the end of 1st week		At the end of 2nd week		χ^2 P	On admission		At the end of 1st week		At the end of 2nd week		χ^2 P
	N	%	N	%	N	%		N	%	N	%	N	%	
▪ No pain	0	0.00	5	12.50	12	30.00		0	0.00	7	17.50	31	77.50	
▪ Mild pain	14	35.00	13	32.50	15	37.50	**18.245**	21	52.50	30	75.00	8	20.00	**79.569**
▪ Moderate	23	57.50	21	52.50	12	30.00	**0.006***	19	47.50	3	7.50	1	2.50	**0.000***
▪ Severe	3	7.50	1	2.50	1	2.50		0	0.00	0	0.00	0	0.00	
Range Mean ± SD	**(2-8) 4.58±1.63**		**(0-7) 3.30±1.92**		**(0-7) 2.20±1.99**		**F=16.423 P=0.000***	**(2-6) 3.73±1.06**		**(0-5) 1.73±1.24**		**(0-4) 0.43±0.93**		**F=93.90 P=0.000**
Gp1 Vs Gp2														
χ^2	4.781		**21.554**		**20.833**									
P	0.092		**0.000***		**0.000***									

* Significant at level P<0.05

Table (7): Distribution of studied critically ill hepatic patients regarding the assessment of numerical rating scale (NRS) for dyspnea throughout periods of intervention.

NRS for dyspnea	The studied hepatic patients (n=80)													
	Control group (n=40)							Study group (n=40)						
	On admission		At the end of 1st week		At the end of 2nd week		χ^2 P	On admission		At the end of 1st week		At the end of 2nd week		χ^2 P
	N	%	N	%	N	%		N	%	N	%	N	%	
▪ No dyspnea	0	0.00	0	0.00	7	17.50		0	0.00	0	0.00	26	65.00	
▪ Mild dyspnea	5	12.50	14	35.00	14	35.00	25.012	9	22.50	32	80.00	12	30.00	105.698
▪ Moderate dyspnea	29	72.50	24	60.00	16	40.00	0.000*	26	65.00	8	20.00	2	5.00	0.000*
▪ Severe dyspnea	6	15.00	2	5.00	3	7.50		5	12.50	0	0.00	0	0.00	
Range Mean ± SD	**(3-7) 5.75±0.92**		**(1-8) 4.45±1.66**		**(0-8) 3.20±2.38**		**F=20.915 P=0.000***	**(4-7) 5.55±0.98**		**(2-6) 3.23±1.27**		**(0-5) 0.73±1.26**		**F=167.334 P=0.000***
Gp1 Vs Gp2 χ^2 P	1.397 0.497		17.043 0.000*		24.982 0.000*									

* Significant at level P<0.05.

Table (8): Distribution of the critically ill hepatic patients regarding the assessment of ascites symptom inventory throughout periods of intervention

Ascites symptom inventory	The studied hepatic patients (n=80)													
	Control group (n=40)							Study group (n=40)						
	On Admission		At the end of 1st week		At the end of 2nd week		χ^2 P	On admission		At the end of 1st week		At the end of 2nd week		χ^2 P
	N	%	N	%	N	%		N	%	N	%	N	%	
▪ Slight ascites	0	0.00	0	0.00	0	0.00		0	0.00	0	0.00	12	30.00	
▪ Mild ascites	0	0.00	0	0.00	18	45.00	66.969	0	0.00	12	30.00	19	47.50	**128.135**
▪ Moderate ascites	19	47.50	35	87.50	21	52.50	0.000*	5	12.50	27	67.50	9	22.50	**0.000***
▪ Severe ascites	21	52.50	5	12.50	1	2.50		35	87.50	1	2.50	0	0.00	
Gp1 Vs Gp2 χ^2 P	**FE 0.001***		**15.699 0.000***		**17.827 0.000***									

* Significant at level P<0.05.

Table (9): Correlation between total score of NRS for chest and dyspnea of the studied critically ill hepatic patients and their ascites symptom inventory throughout periods of intervention.

Total NRS score	The studied hepatic patients (n=80) Ascites symptom inventory											
	Control group (n=40)						Study group (n=40)					
	On admission		At the end of 1st week		At the end of 2nd week		On admission		At the end of 1st week		At the end of 2nd week	
	r	P	R	P	r	P	r	P	r	P	r	P
Chest	**0.444**	**0.004****	**0.316**	**0.047***	**0.572**	**0.000****	**0.372**	**0.018***	**0.527**	**0.000****	**0.400**	**0.010***
Dyspnea	**0.411**	**0.009****	**0.180**	**0.265**	**0.593**	**0.000****	**0.411**	**0.008****	**0.553**	**0.000****	**0.463**	**0.003****

r: Pearson/Spearman' correlation coefficient

* Statistically significant at level P<0.05. ** highly significant at level P<0.01.

Discussion

Cirrhosis of the liver without compensatory factors is the terminal phase of chronic liver disease caused by any factor which leads to ascites and other complications. Ascites is the most prevalent complication seen in cirrhotic individuals. Numerous life-threatening problems may ensue, ultimately culminating in an unfavourable prognosis for long-term survival. Bacterial infections, including spontaneous bacterial peritonitis, hepatorenal syndrome, a rare form of progressive kidney failure, abdominal pain, inguinal hernia, pleural effusion (which can cause difficulty breathing and hypoxemia), and hepatorenal syndrome are all potential complications of ascites. **(Adhyatm et al., 2022)**.

Hypoxemia means that the oxygen level in the blood is low. It might result in symptoms like dyspnea and fast respiration, fast or pounding heartbeat and confusion. Hypoxemia should be detected at an early stage to prevent serious consequences. So according to the present study finding, implementation of nursing measures had a positive impact on participants' vital signs, reducing hypoxemia, improve physiological parameters and decrease severity of chest pain and dyspnea **(Odriscoll et al.,2017)**.

Bio-demographic characteristics in the current study In both study groups, patients between the ages of 50 and 60 comprised the majority of the population. This may be a result of older individuals are more susceptible to toxic compounds that harm the liver compared to younger individuals, and the healing of damaged liver cells occurs more slowly in the elderly.

This result was in the same line with **Nabil et al (2019) in a study about the association between pulmonary function tests and the degree of liver cirrhosis** who reported that the majority of hepatic patients were in the mean age of (47.5 ± 17.2) years. This finding was disagree with **Olave et al (2020)** who stated that majority of studied patients was within (18-40) years.

In relation to gender, Males comprised more than half of the patients in both the research and control groups, according to the current study. This may be because males are more likely than females to be exposed to occupational illnesses associated with agricultural work. This result was in congruent with **Priyanka et al (2017)** said that men comprised the majority of patients with hepatic failure in the study population. This finding was in contrast with **Nabil et al (2019)** who noted that females comprised almost two-thirds of the patients with hepatic failure in the study.

According to body mass index, more over one-third of patients in both the control and study groups were overweight, according to the current research (25-<30). This could be due to an accumulation of adipose tissue in the liver resulting from energy surplus. Abnormal fat accumulation occurs when the liver fails to metabolise and degrade lipids in the prescribed manner and cause non-alcoholic fatty liver disease, edema associated with hepatic failure and ascites. This result was in accordance with **Yin et al (2021)** who underlined that

overweight individual comprised more than half of hepatic patients with ascites. This finding was contradicted with **Jian et al (2020)** who stated that the median body mass index of majority of hepatic patients was (24.8 ± 3.4).

Concerning past medical history, the findings of the present investigation indicated that over one third of patients in control and study groups had diabetes mellitus. The main cause of this factor is a considerable variety of liver problems, such as fatty liver disease, increased liver enzymes, cirrhosis, hepatocellular carcinoma, and abrupt liver failure, are related with type 2 diabetes. This result was in the same line with **Rubin et al (2020)** who reported that about one-third of the individuals under study had diabetes mellitus. The finding was in contrast with **Coman et al (2021) who** stated despite the fact that liver cirrhosis is significantly correlated with diabetes mellitus, over 80% of liver cirrhosis patients exhibit glucose intolerance. Majority of hepatic patients had diabetes mellitus.

Regarding past surgical history, approximately one third of patients in both the control and research groups lacked a prior surgical history. **As regard to medication history,** the majority of patients in study and control groups received diuretics. This could be attributed to the nature of disease to control body fluid volume. This result was supported by **Qavi et al (2015)** According to research on the clinical usage of diuretics in heart failure, liver cirrhosis, and nephrotic syndrome, the majority of hepatic patients get diuretics as the second-line therapy for cirrhotic ascites. This result was disagree with **Annamalai et al (2016)** who found that diuretics not effective in treatment refractory ascites.

Concerning respiratory rate, heart rate and body temperature, the results of the current investigation demonstrated that the study group had enhanced physiological measures in comparison to the control group. This could be due to the implementation of nursing measures which include rapid monitoring of oxygen saturation with pulse oximeter and supplemental of oxygen therapy. This outcome was consistent with **Joshi et al (2020)** claimed that pulse oximetry is the most effective technology now available for continuous real-time monitoring and detection of hypoxemia.

This discovery was in opposition to **Abraham et al (2023)** who said although the arterial blood gases approach is regarded as the gold standard, pulse oximetry may not be able to properly estimate oxygenation when spo2 levels fall below 90%.

Concerning respiratory rate and depth of respiration, the results of the current investigation demonstrated that over two-thirds of the patients comprising the research group had typical respiratory depth. The observed outcome may be ascribed to the execution of deep breathing and coughing exercises. This result was in compliance with **Saif et al (2023)** who said that practicing coughing and deep breathing effectively reduced respiratory issues and dyspnea.

With regard to respiratory rhythm, the findings of the present investigation indicated that a minority of the patients comprising the study group had a regular respiratory rhythm. The observed outcome may be ascribed to the execution of deep

breathing and coughing exercises. This result was in the same line with **Nese et al (2022) in research examining the impact of deep breathing and progressive muscle relaxation techniques on COPD patients' sensations of tiredness and dyspnea** who emphasized that deep breathing exercise was effective in reducing respiratory problems and dyspnea. **Regarding use of accessory muscle,** according to the results of the current investigation, the majority of patients in the study group didn't use accessory muscle. This could be due to improve respiratory rate, depth and rhythm due to implementation of deep breathing technique and coughing exercise. **Concerning chest pain,** it was found that a statistically significant improvement in chest pain was seen in the study group compared to the control group from the time of admission to the end of the second week after the introduction of nursing interventions. This factor is mostly caused by placing the patient in the fowler posture. This finding was corroborated by **Srimookda et al (2021)** who reported that fowler position decrease dyspnea and chest pain. This discovery stood in opposition to **Patel et al (2021)** Who reported that the semi-posture fowlers had more efficacy in enhancing lung functions and oxygen saturation.

As regard oxygen saturation, Oxygen saturation significantly increased after the deployment of nursing interventions compared to pre-implementation in the study group than control group from admission to the end of 2nd week, two third of patients in study group had normal oxygen saturation. This could be attributed to putting patient in fowler position and maintain good ventilation. This outcome was consistent with **Nandar et al (2022)** who found that the high fowler posture improves oxygen saturation by allowing the chest cavity to expand significantly and lung expansion to rise.

This finding was against **Chaudhuri et al (2020)** who mentioned even the insertion of a high-flow nasal cannula failed to reduce hypoxemia.

Regarding numerical rating scale for chest pain assessment, from admission to the conclusion of the second week, the present research revealed a substantial improvement in chest pain in the study group after implementation of nursing interventions compared to the control group prior to implementation. According to the results of the current investigation, the majority of patients in the research group did not have chest discomfort. This finding was corroborated by **Gerald et al (2022)** who stated that numerical rating scale for pain assessment the most practical magnitude 91 % of patients were able to use it by following straightforward instructions.

In relation to numerical rating scale for dyspnea assessment, an improvement in dyspnea was seen in the study group compared to the control group from the time of admission to the end of the second week after the introduction of nursing interventions. According to the results of this investigation, almost two-thirds of the patients in the research group did not exhibit dyspnea. This result was supported by **Stevens et al (2019)** who placed particular emphasis on its numerical rating scale for dyspnea assessment the most feasible self-reported scale for dyspnea assessment.

Regarding ascites symptom inventory scale throughout periods of intervention, the results of the current investigation demonstrated that the study group differed significantly from the control group. This may be ascribed to the evaluation and control of ascites. The key to curing ascites is identifying and addressing the illness or condition that causes excessive fluid volume. Additionally, monitoring abdominal circumference may offer insight into treatment response and efficacy.

This result was in the same line with **Kawaratani et al (2021)** who stated that a scale unique to symptoms of ascites was created, and its responsiveness, validity, and reliability were established. The assessment of ascites therapy efficacy and the tracking of treatment responses in patients with ascites may be accomplished using this uncomplicated scale. As needed, limit fluid and salt consumption; sodium restriction reduces fluid retention in extravascular areas. Assist in the preparation of paracentesis. Therapeutic paracentesis may be performed to alleviate the symptoms associated with ascites. Medication administration: In order to manage ascites and edema, doctors may recommend the use of diuretics or albumin as an adjuvant to prevent fluid reabsorption.

This result was similar to **Veronica et al (2020) Regarding the respiratory and symptomatic effects of paracentesis for the alleviation of ascites in individuals with hepatic cirrhosis, one research found:** The patients under investigation exhibited a significant decrease in respiratory rate and an enhancement in peripheral oxygen saturation after to paracentesis. This outcome stood in opposition to **Rudler et al (2020)** who pointed out that paracentesis, diuretics and restricting sodium and fluid intake wasn't effective in treatment of refractory ascites.

Regarding the link between the cumulative score on a numerical rating scale for dyspnea and chest pain among critically sick hepatic patients under study and their inventory of ascites symptoms throughout intervention periods, the current study showed that positive and highly significant correlation was observed between numerical rating scale for chest pain and ascites symptom inventory scale on admission and at the end of 2nd week in both study and control group patients throughout periods of intervention. Additionally, a positive and very significant association was detected on admission and at the end of 2nd week between numerical rating scale for dyspnea and ascites symptom inventory scale in both study and control group patients throughout periods of intervention. These findings are in favour of **Wittmer et al (2020)** The individual who discovered a favourable association between ascites, dyspnea and chest pain. Ascites drainage increases lung volumes and thoracic expansion in individuals with liver cirrhosis reduces dyspnea and chest pain, it can be concluded that hepatic patients have adverse respiratory and symptomatic effects due to ascites.

Conclusion:

The present study showed that the research group exhibited an elevation in both respiratory rate and heart rate than control group in 2nd week. While there was a significant difference between patients in the study group regarding body temperature. Also, a significant difference

was seen between the patients in the experimental group and the control group with respect to respiratory assessment (depth, rhythm of respiration and use accessory muscle) and characters of chest pain on admission, post a week and post 2 weeks. There was a statistically significant difference between patients in the study and control group regarding oxygen saturation, dyspnea and chest pain assessment. Additionally, there was positive correlation between numerical rating scale for chest pain, dyspnea and ascites symptom inventory scale on admission and in 2nd week. Finally, concluded that, the nursing measures had positive effect on decreasing hypoxemia for critically ill patients suffering from ascites by improving oxygen saturation, physiological parameters and reducing dyspnea, chest pain.

Recommendation:

In accordance with the results of the current investigation, the following may be suggested:

-Studying hypoxemia resulting from hepatic ascites more broadly in the nursing specialty.

-Generalizability of the findings requires replication of the same research using a bigger probability sample in several geographic regions.

- Further research should strive to include a wide range of people so as to determine if comparable variables have an equivalent role in the development of hypoxemia.

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