

## Efficacy of Educational Bundle on Patients' Clinical Outcomes Post-Esophageal Varices Treatment

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### Abstract

**Background:** Esophageal varices are one of the most significant comorbidity-related complications of liver cirrhosis. Patients with esophageal varices reported unsatisfactory levels of knowledge and fatigue, as well as recurrent hospital readmissions. **The aim:** The study aimed to assess the efficacy of the educational bundle on patients' clinical outcomes post-esophageal varices treatment. **Setting:** This study was done in the Gastroenterology and Hepatology department at Specialised Medical Hospital. **Research design:** This research employed a quasi-experimental design. **Sampling:** A purposive sample of one hundred patients with esophageal varices was recruited. **Tools:** This study utilized three tools to acquire relevant data. Tool I was the patients' assessment questionnaire, Tool II was the patients' knowledge questionnaire, and Tool III was the modified fatigue impact scale. **Results:** The current study showed that after using the educational bundle, 46% of the study group and only 2% of the control group had a satisfactory knowledge level, showing a statistically significant difference ( $p=0.007$ ) between the two groups. Moreover, after two weeks of receiving the educational bundle, 94% of the study group and 80% of the control group had mild fatigue levels, showing a statistically significant difference. Regarding the readmission rate, there was a highly statistically significant difference between the two groups after three months of implementing the educational bundle. **Conclusion:** The educational bundle significantly improved the clinical outcomes of the study groups' post-esophageal treatment in knowledge, fatigue levels and hospital readmission. **Recommendations:** Patients with esophageal varices should receive the educational bundle as standard treatment.

**Key words:** Educational bundle, Clinical outcomes, Esophageal varices treatment.

### Introduction

In liver cirrhosis, esophageal varices (EV) are the most dangerous portosystemic shunts. Esophageal varices are enlarged and abnormal veins located in the lower part of the esophagus. Varices result from portal hypertension, which develops when the blood pressure in the portal veins rises above ten mmHg. This rise is caused by scar tissue or a clot restricting the liver's normal blood supply. Varices form when blood bypasses the larger vessels and flows through the small vessels in the esophagus (Sohal et al., 2022).

If EV bleed, they are among cirrhotic patients' primary causes of death. Esophageal variceal bleeding is a potentially fatal emergency with a high morbidity and mortality rate. About 75% of all upper gastrointestinal bleeding in Egypt is caused by EV. Esophageal varices cause 20% of mortality among Egyptian patients between the ages of 35 and 75. Dizziness, melena, hematemesis, hypotension, tachycardia, and shock indicate varices' hemorrhage (Boregowda et al., 2019).

Patients with bleeding varices are considered dangerously ill and must be admitted to the intensive care unit immediately. About 20% of patients with hematemesis, melena, or both ultimately die during the first attack. Varices' management includes blood volume replacement, pharmacotherapy, endoscopic treatment, and a transjugular intrahepatic portosystemic shunt (Bilal, Abougergi, Tayyem, Parupudi, & Rockey, 2020).

Hussien, Abd-Elrhaman, and Abd-Elhady (2020) say that the goal of treatment is to keep blood flow going and to start an endoscopic procedure to stop or reduce bleeding. Patients had unexpected negative outcomes following EV treatment. Fatigue is one of the most commonly reported symptoms following varices treatments. In addition, patients' knowledge regarding EV could have been better (Mohamed, Reizian, Elkholy, & El-Deeb, 2021).

Negative outcomes reduce patients' quality of life, impair their cognitive abilities, increase hospital readmissions, and increase

mortality. The mean length of stay after an episode of EV bleeding is 3.8 days and becomes 15.2 days for patients who develop complications. Esophageal varices patients' knowledge and concerns must be well comprehended. Understanding the patient's informational requirements and concerns is the cornerstone of designing an effective patient educational bundle (DiMaio, 2019).

A planned educational bundle is a critical tool in esophageal varices' management. A well-designed educational bundle provides significant benefits in terms of knowledge and behavioral changes. An education bundle enables patients to get involved right away in their recovery. Using an educational bundle allows for early detection and management if complications arise. Every nursing care intervention must include the patient's educational bundle as a crucial element (Shen, Zheng, He, & Mao, 2021).

A good educational bundle should highlight medications, diets, follow-up appointments, and appropriate self-care. Adherence to an educational bundle is key to improving clinical outcomes and preventing long-term complications (Saber, Shakwier, & El-Kattan, 2020). Therefore, it seems imperative to design and implement an educational bundle and evaluate its efficacy on patients' clinical outcomes post-esophageal varices treatment.

#### **Significance of the study:**

Variceal haemorrhage is a common and potentially life-threatening complication that arises from liver cirrhosis, posing a significant threat to an estimated 25% to 40% of the global patient population. The incidence of haemorrhage attributed to EV and its corresponding mortality rates have demonstrably displayed a sustained upward trend. It is widely acknowledged within the medical community that the onset of medical emergencies in patients is a significant contributor to high rates of morbidity and mortality (Ali, Ahmed, & Khorai, 2020).

Upon successful management of the episode of acute variceal bleeding, the predominant issue that persists pertains to the possibility of the reoccurrence of varices and subsequent bleeding after undergoing

endoscopic treatment. The management of EV necessitates a favourable prognosis that precludes any likelihood of relapse, a critical component in the extended care of patients afflicted with portal hypertension (Mahdy, Khorais, & Abdelhamid, 2018).

The acquisition of a comprehensive educational bundle can effectively augment a patient's capacity to manage his or her medical ailment while simultaneously mitigating the incidence of complications. Patients who possess a higher level of knowledge are more inclined to exhibit a greater degree of concern for their health and subsequently engage in the necessary measures for its preservation. Individuals are prone to exhibit a greater likelihood of symptom management, timely identification of the onset of complications, and prompt medical consultation (Saber et al., 2020). Hence, the current study was undertaken to evaluate the impact of an educational bundle on the effectiveness of post-treatment clinical outcomes in patients with EV.

#### **Aim of the study:**

The study aimed to assess the efficacy of the educational bundle on patients' clinical outcomes post-esophageal varices treatment.

#### **Research objectives:**

This research was accomplished by doing the following:

- Assessing patients' needs after EV treatment
- Developing and implementing an educational bundle constructed on patients' needs assessments
- Evaluating the impact of an educational bundle on patients' clinical outcomes

#### **Research hypotheses:**

H1: Patients in the study group will exhibit elevated levels of knowledge following the educational bundle compared to those in the control group.

H2: Patients in the study group will demonstrate an improvement in their fatigue levels following receipt of the educational bundle compared to those in the control group.

H3: The study group will exhibit decreased rates of readmission subsequent to receiving the educational bundle in contrast to the control group.

**Operational definition:**

**Patients' clinical outcomes:** Clinical outcomes are things that happen after EV are treated (Saber et al., 2020). This study incorporates the assessment of patients' clinical outcomes, comprising their level of knowledge, fatigue, and the rate of readmission.

**Educational bundle:** A well-organised collection of educational interventions that a nurse can employ collectively leads to a statistically significant enhancement in patient outcomes. The present study incorporates educational sessions consisting of three didactic lectures and an informative booklet.

**Subjects and methods:****Research Design:**

The design of this study was quasi-experimental. This design is the best to achieve the aim of this study. This design is an experimental intervention used to quantify the causal influence of an intervention on its intended population. Therefore, this design was utilized to compare the effect of an educational bundle among patients following EV treatment regarding their clinical outcomes (Ariel, Bland, & Sutherland, 2022).

**Research Setting:**

This research was carried out in the inpatient Gastroenterology and Hepatology department at Specialised Medical Hospital, Mansoura University, Egypt. The Gastroenterology and Hepatology department for inpatients has five rooms. Each room has ten beds, a sink for washing hands, and a table for storing supplies and medicine.

**Subjects:**

A purposive sample of 100 patients with EV was invited to participate in this study. It was calculated sample size for studying the efficacy of an educational bundle on patients' outcomes post-varices treatment using sample size calculator software (Sean P. Kane, 2022). At 1%  $\alpha$  error (99.0% significance) and 10.0  $\beta$  error (90.0% power of the study), assuming the average outcomes score after implementing the bundle among the study group is 37.1%. In the control group, 57.1% (Saber et al., 2020), the calculated sample was 92 participants. The researchers added 10% for improved data and follow-up drops, bringing the total sample size

to 100. Then, this sample was divided equally into control and study groups.

**Inclusion criteria:** The study sample includes adult patients of both genders between the ages of 21 and 60 who are currently free from active bleeding associated with EV. These patients possess the ability to effectively communicate with others and demonstrate stable hemodynamics. Additionally, the sample is composed of patients who have not received prior educational instructions related to the study but have provided their consent to participate.

**Exclusion criteria:** Patients diagnosed with hepatocellular carcinoma, advanced liver cell failure, severe portal hypertension, present with concurrent comorbidities, including renal impairment, or handicaps of a physical or mental nature.

**Tools of data collection**

This study gathered relevant data using three tools:

**Tool I: Patients' Assessment Questionnaire**

After studying national and international literature reviews, researchers constructed Tool I (Mohamed et al., 2021; Sohal et al., 2022). This tool was used to evaluate patients' sociodemographic and current medical histories. It consisted of two parts: part one assessed the sociodemographic features of the patients. These features included age, gender, job, marital status, and level of education. Part two concerns the patient's current medical history, including how the varices are diagnosed, associated manifestations, readmission rate, and intervention for bleeding.

**Tool II: Patients' Knowledge Questionnaire**

Researchers created Tool II after reviewing the relevant literature (Mohamed et al., 2021; Saber et al., 2020). Tool II contained questions regarding patients' knowledge about EV treatment. This tool included 29 multiple-choice questions divided into five sections. The first section included three questions regarding esophageal varices' definition, sites, and causes. The second section comprised seven questions regarding treatment purposes, methods, contributing factors, and increasing disease risk.

The third section included four questions regarding endoscopy preparation and precautions before, during, and after the procedure—five questions about diet after EV

treatment were included in the fourth section. The fifth section included ten questions regarding complications that may occur.

**Scoring system.** Each accurate response was worth one point, while each erroneous response was worth zero points. The score was 76 points overall. Some questions had multiple correct answers. The total level of patients' knowledge score was categorized as follows based on the statistical report: 60% and above was satisfactory, while less than 60% was unsatisfactory.

### **Tool III: Modified Fatigue Impact Scale (MFIS)**

Tool III represented a modified version of the Fatigue Impact Scale (**Strober et al., 2020**). This tool examined the effects of fatigue on patients' quality of life. The MFIS was generally presented as a 21-item. This tool contained nine physical, ten cognitive, and two psychosocial items (**Cozart et al., 2021**).

**Scoring system.** Patients were asked to answer MFIS questions using a five-point Likert scale, with zero for never, one for rarely, two for sometimes, three for often, and four for always. The total score was 84. Higher ratings indicated a bigger influence on life quality (**Szymańska-Chabowska et al., 2021**). The total level of the patient's fatigue score was categorized as follows:

- Mild fatigue was defined as up to 50%.
- Moderate fatigue was greater than 50% but less than 75%.
- Severe fatigue was above 75%.

### **Validity and reliability**

**Validity:** A panel of experts in the relevant domains evaluated the content-related validity of the designed and translated tools. Seven experienced professors, four from the college of nursing and three from the department of Gastroenterology and Hepatology, evaluated the implementation tools for clarity, relevance, and application. According to their comments, small adjustments were made.

**Reliability:** In the current study, Cronbach's alpha coefficient for the Tool II knowledge questionnaire was 0.73. Internal consistency of the MFIS was high (Cronbach's alpha of 0.81 and reliability below 0.87 for the full scale and subscales).

**A pilot study,** including 10 patients (10% of the study sample), was conducted to assess the feasibility and usability of the data collection tools. These patients were excluded from the study's sample population. The required adjustments were made appropriately.

### **Ethical considerations and Human Rights:**

The Research Ethical Committee of the Faculty of Nursing at Mansoura University, Egypt, granted ethical permission (**Ref No. 0363**). The researchers obtained formal written permission from the pertinent authorities at the Specialised Medical Hospital in order to carry out the research. After clarifying the purpose of the study, each participant with EV provided informed permission. The researchers informed the participants that their participation was entirely optional. Throughout the whole study, anonymity, privacy, safety, and secrecy were guaranteed. Participants might withdraw from the research at any time. The questionnaire did not contain names or other identifying information about the participants.

### **The theoretical framework for the study:**

The study had four phases:

#### **Assessment phase**

The researchers examined current, relevant literature from both local and international sources. Therefore, the researchers created two study tools: tool I (a patient assessment questionnaire) and tool II (a patient knowledge questionnaire). Study tool III (MFIS) was adopted from **Strober et al. (2020)**. The study tools were initially subjected to translation from English to Arabic, followed by a re-translation process by the researchers.

The selection of the sample was based on the predefined study criteria as determined by the researchers. All study samples were talked to one-on-one upon admission and before applying the educational bundle. Control group data were obtained before study group data to avoid data contamination. The researchers gathered the data each week on Sunday, Tuesday, and Thursday mornings. The data collection process was initiated in August 2022 and concluded in February 2023.

#### **Planning phase**

Based on an analysis of relevant literature (**Atya, Mekkawy, Abd El-Malek, & Abd Almeged, 2019**) and the results of the

baseline knowledge assessment, the researchers put together the educational bundle. This educational bundle aimed to improve clinical outcomes regarding knowledge and fatigue levels, as well as lower hospital readmissions after varices treatments. The researchers created an informative booklet to offer patients information in a straightforward manner using basic language and vivid images. This booklet was given to all patients at the proper time. The experts' opinions validated the validity of the booklet.

### Implementation phase

The researchers disclosed themselves and explicated the objective and character of the study. The researchers implemented the educational bundle for the study group clearly and concisely. The educational bundle was comprised of three pedagogical sessions, which were accompanied by a vividly designed Arabic booklet. The study group received three sessions aimed at improving clinical outcomes. The general knowledge about EV, including its definition, causes, and different treatment methods, was covered in the first session. The second session contained instructions about preparation before, during, and after endoscopy. The third session encompassed information regarding proper nutrition, management strategies for fatigue, the prevention of precipitating factors, and the importance of compliance with a therapeutic regimen.

Each session of the educational bundle took about 30 to 40 minutes daily. The media used included pictures and data shows with questions and discussion throughout the interview. In addition, each patient in the study group was given a colorful Arabic booklet to catch his attention, stimulate him, assist with the review at home, and promote instruction and practice. The control group was treated with standard hospital care.

### Evaluation phase

The researchers evaluated both groups' knowledge using Tool II. In addition, patients' fatigue levels were evaluated by using Tool III. Moreover, hospital readmission data were collected using Tool I, Part 2. The researchers completed the data collection sheet with the

patients two times after the initial assessment (pre, post-two weeks, and post-three months).

### Statistical design:

In addition to the presentation of numerical data as mean and standard deviation (SD) values, categorical variables also included a number and a percentage. A student t-test of significance and a Chi-square test were used when comparing categorical variables. IBM SPSS Statistics version 20 for Windows was employed for the statistical analysis.

### Results

**Table 1** shows that before the implementation of the educational bundle, there were no significant sociodemographic differences between the two groups, except for work and marital status, which had a  $p$ -value of 0.001.

**Table 2** indicates that there were no statistically significant differences between the research groups regarding the current medical history items, except for item number two, "How are varices diagnosed?" This question had a  $p$ -value of 0.02, which was a statistically different from the other questions.

**Table 3** demonstrates that, before the implementation of the educational bundle, there was no statistically significant difference between the two groups since both groups had an unsatisfactory knowledge level. Nevertheless, after two weeks of implementing the educational bundle, 46% and 2% of the study and control groups had a good knowledge level, showing a statistically significant difference ( $p = 0.007$ ) between the two groups. After three months, approximately 78% and 10% of the study and control groups had adequate knowledge levels, showing a statistically significant difference ( $p = 0.000$ ) between the two groups.

**Table 4** clarifies that, before applying the educational bundle, all the study and control groups (100%) had moderate fatigue. Interestingly, after two weeks of the educational bundle, 94% and 80% of the study and control groups had mild fatigue levels, showing a statistically significant difference. Also, three months after the bundle was put into place, 66% of the study group and 60% of the control group reported mild fatigue, showing a statistically significant difference.

**Figure 1** shows that the readmission rate was not statistically different between the two groups before and after two weeks of implementing the educational bundle. However, after three months, the researchers found a

statistically significant difference between the two groups.

<b>Table 1: Socio-demographic features of patients in two groups (N=100)</b>						
Items	Study group (N=50)		Control group (N=50)		$\chi^2$	P-value
	No.	%	No.	%		
<b>Age</b>						
40- 49 years	9	18	11	22	0.267	0.875
50- 59 years	31	62	29	58		
60 years	10	20	10	20		
Mean $\pm$ SD	55.64 $\pm$ 4.11		55.1 $\pm$ 4.37		T= 0.1414	0.887
<b>Gender</b>						
Male	23	46	28	56	1.00	0.317
Female	27	54	22	44		
<b>Work</b>						
Does not work	7	14	1	2	15.68	< 0.001**
Employee	8	16	10	20		
Worker	21	42	22	44		
Housewife	14	28	17	34		
<b>Marital status</b>						
Single	1	2	1	2	15.73	< 0.001**
Married	26	52	40	80		
Divorced	6	12	0	0		
Widow	17	34	9	18		
<b>Educational Level</b>						
Illiterate	30	60	33	66	0.39	0.534
Basic	20	40	17	34		
Bachelor	0	0	0	0		
$\chi^2$ : Chi-square test		<i>p</i> : <i>p</i> -value between the studied groups				
**: $P \leq 0.001$		T: Student t-test				

**Table 2:** Present medical history of all the research groups (N=100)

Items	Study group (N=50)		Control group (N=50)		$\chi^2$	P value
	No.	%	No.	%		
How the varices are diagnosed?						
During Periodic examination	0	0	3	6	16.29	0.02*
Sudden hematemesis	31	62	33	66		
Dark stool	19	38	14	28		
Associated signs & symptoms						
Drowsy, blurred vision	19	38	5	10	10.92	0.09
Upper abdominal side pain	15	30	24	48		
Loss of consciousness	16	32	21	42		
Intervention for bleeding						
Esophageal Varices ligation	33	66	37	74	0.76	0.38
Esophageal varices Sclerotherapy	17	34	13	26		
$\chi^2$ : Chi-square test      p: p-value between the research groups						
*: p < 0.05						

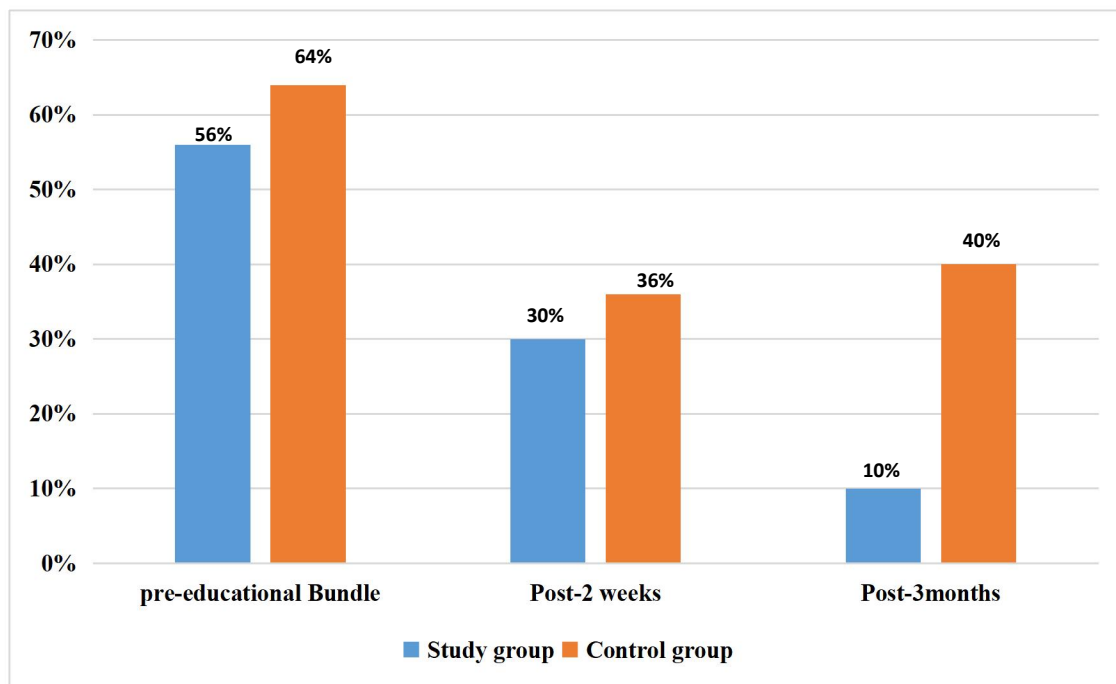
**Table 3:** The impact of the educational bundle on the knowledge levels of the two groups (N=100)

Items	Knowledge level	Study group (N=50)		Control group (N=50)		$\chi^2$	P value
		No.	%	No.	%		
Pre-educational bundle	Satisfactory	0	0	1	2	0.842	0.358
	Unsatisfactory	50	100	49	98		
Post-two weeks	Satisfactory	23	46	1	2	1.76	0.007*
	Unsatisfactory	27	54	49	98		
After three months	Satisfactory	39	78	5	10	8.00	0.000**
	Unsatisfactory	11	22	45	90		
$\chi^2$ : Chi-square test      *: p < 0.05							
p: p-value between the research groups      **: P ≤ 0.001							

**Table 4:** Comparison of fatigue levels between both groups (N=100)

Items	Fatigue level	Study group N=50		Control group N=50		Test	P value
		No.	%	No.	%		
Pre	Mild	0	0	0	0	-----	-----
	Moderate	50	100	50	100		
	Sever	0	0	0	0		
	Mean ± SD	21.2± 11.9		21.2± 11.9			
Post-two weeks	Mild	47	94	40	80	$\chi^2 = 6.09$	0.018*
	Moderate	3	6	5	10		
	Sever	0	0	5	10		
	Mean ± SD	16.6± 3.4		26.5± 13.1		T = 5.5	0.000**
After three months	Mild	33	66	30	60	$\chi^2 = 3.09$	0.078
	Moderate	15	30	15	30		
	Sever	2	4	5	10		
	Mean ± SD	10.9± 3		29.2± 11.2		T = 8.44	0.000**

$\chi^2$ : Chi-square test  
\*:  $p < 0.05$   
\*\*:  $P \leq 0.001$   
T: Student t-test  
*p*: p-value between the research groups



**Figure 1:** Comparing the readmission rates of both the study and control groups before and after the implementation of the educational bundle (N=100)

## Discussion

Cirrhosis can cause EV, which are potentially fatal complications (Hussien, Abd Elrhaman, & Abd Elhady, 2020). The present

research proposes that the application of the educational bundle may improve patients' clinical outcomes post-esophageal varices treatment. The findings of this study, before the bundle, the



patients in the control and study groups were similar in their underlying variables. Regarding the patients' sociodemographic features, the present study's findings indicate that more than half of the patients in both groups were in their fifties.

We hypothesize this finding because most hepatic disease patients are adults, and the inclusion criteria for the current research identified a specific age range of 21 to 60 years. The present result is consistent with the previous study conducted by **Chuah et al., (2019)**, who found that most of the sample was in their fifties. In contrast, **Al-Johani, Al-Jehani, and Al-Zahrani (2018)** found that roughly two-fifths of the participants were between the ages of 20 and 35.

In this study, more than fifty percent of the study group was female, while more than fifty percent of the control group was male. However, the difference between the two groups is insignificant. To explain the gender finding in the control group, the typical history of liver disease showed that 55% and 70% of all cases were in men (**Sohal et al., 2022**). From the researchers' point of view, half of the study group consisted of female patients because female patients may develop liver cirrhosis later than males related to the protective activity of estrogen (**Lee et al., 2019**).

A previous study by **Saber et al. (2020)**, which discovered that more than half of the study group was male and more than half of the control group was female, supports the current result. This result goes against what **Sohal et al. (2022)** found: that most of the patients in the sample were men. Regarding patient occupation, more than two-fifths of the study and control groups were employed. This result is consistent with **Weheida, Ismail, Selem, Salem, and Elfa's (2020)** observation that approximately half of the patients perform physical work.

In this research, more than fifty percent of the study and most of the control groups were married. This finding is consistent with **Atya et al. (2019)**, who discovered that most patients in the sample were married. Concerning patient education, around two-thirds of patients in both groups needed to be more literate. This finding is supported by **Atya et al. (2019)**, who noted that around two-thirds of patients in the study needed

to be educated. This finding is challenged by **Saber et al.'s (2020)** study, which discovered that two-fifths of patients in both groups had completed secondary school.

Concerning the present medical history, these results revealed that two-thirds of patients in both groups were first diagnosed with EV through sudden hematemesis. **Pawde and Chougale (2022)**, in contrast, reported that the most common presentation among the studied sample was melena. Regarding associated manifestations, this result shows that more than one-third of the study group complained of drowsiness and blurred vision. In contrast, less than half of the control group had upper abdominal pain.

This finding can be explained by the fact that patients may suffer multiple episodes of hematemesis and melena before hospital admission, postpone seeking medical attention, and reduce their fluid intake. This outcome is consistent with **Weheida et al.'s (2020)** research, which found that most control and study group patients were hypovolemic upon arrival.

Regarding the management of esophageal bleeding, the present results clarify that two-thirds and less than three-quarters of patients in the study and control groups had EV ligated. This finding can be explained by the fact that endoscopic variceal ligation might be superior to pharmacological therapy regarding the prevention of the first bleeding episode. This finding is corroborated by research conducted by **Boregowda et al. (2019)**, who found that the first-line treatment for the management of EV bleeding is ligation.

One of the most significant outcomes of this research is related to the total satisfaction level of patients' knowledge. This study shows that almost all patients in both groups were unsatisfied before the implementation. This finding can be explained by the fact that roughly two-thirds of both groups of patients were illiterate. Patients with a low education degree typically need more health-related awareness and understanding.

This result is reinforced by **Samad et al. (2018)**, who noted that most of the study sample had a low educational level, resulting in a lack of disease-related knowledge. This study concurs with **Mohamed et al. (2021)**, who said that neither the control nor study groups knew enough

about EV and their causes. In this study, after the bundle's implementation, the knowledge level was higher in the study group than in the control group.

From the researchers' point of view, these results may be because the designated educational bundle worked well. This result is in line with **Shen et al.'s (2021)** finding, who mentioned that after the intervention, the disease knowledge mastery rates were significantly higher in the observation group than those in the control group.

This study's finding demonstrates that after two weeks of the implementation of the educational bundle, the study group patients reported a milder level of fatigue than those in the control group. However, the two groups had similar fatigue levels after three months. From the researchers' perspective, these results may be because patients were taught how to deal with fatigue as part of their educational bundle.

This finding is consistent with the findings of **Trivedi and Tapper (2018)**, who discovered that teaching patients fatigue management strategies had a highly significant positive impact on their health. The current findings highlight that the implemented bundle positively affected the readmission rate between the two groups three months later. This result can be interpreted as providing patients with sufficient knowledge of managing disease decreases hospital readmission.

This finding is supported by **Everett and Lidofsky's (2018)** study. They found that patients who kept up with surveillance endoscopies after an esophageal variceal hemorrhage returned to the hospital less often. Furthermore, this result is

consistent with **Piñero-Fernández et al. (2021)**, who discovered that a personalized, integrated care program lowered hospital admissions.

#### **Limitation of the study**

The results of the current study cannot be generalized because the sample was only drawn from one setting (Specialised Medical Hospital, Mansoura University, Egypt).

#### **Conclusion**

The findings showed that after applying the educational bundle, the overall knowledge levels had improved, with statistically significant differences between the two groups. The results also showed that the educational bundle made a statistically significant difference in fatigue levels in the study group compared to the control group after three months. The readmissions rate also, showed statistically significant differences between the two groups after three months of the educational guidelines. Finally, the results of the current study supported the research hypothesis by showing that the use of an educational bundle improved patients' clinical outcomes in terms of knowledge and fatigue levels, as well as reducing hospital readmissions after EV treatment.

#### **Recommendations**

- To ensure that the results can be used in other hospitals, the current study should be done again with a larger sample size and in a different hospital.
- Setting up a website with all the information about EV and health education in general, including different teaching materials, media, and audio-visual aids.

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