

Effect of Educational Intervention on Knowledge, Satisfaction and Quality of Bowel Preparation for Patients Scheduled for Colonoscopy



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1.ABSTRACT

Background: Colonoscopy is considered one of the most significant screening and therapeutic modality for colorectal cancer. Colonoscopy depends on pre-procedure bowel preparation unlike other screening tests as if patient undergone poor bowel preparation, significant pathology may be missed. This study was aim to evaluate the effect of an educational intervention on knowledge, satisfaction and quality of bowel preparation for patients scheduled for colonoscopy. This study was conducted at Gastrointestinal Endoscopy unit at Cardiac and Gastrointestinal Center - Domyata, Egypt. Quasi-experimental design was utilized in this study on a purposeful sample of (120) patients in the previous mentioned setting. Two tools were used to collect the data. Tool I: Colonoscopy Patient assessment sheet, Tool II: Quality of bowel preparation for colonoscopy Assessment. **Result:** It was found that majority of study group (90%) had an excellent quality of bowel cleanliness as measured by Boston bowel scale post educational intervention compared to control group (60%). **Conclusion:** Highly statistically significant improvement in total knowledge level related to colonoscopy preparations, quality of bowel preparations and patient satisfaction. The study recommended that availability of written visual information about proper colonoscopy bowel preparation facilitate patient's education and improve quality of bowel cleanliness.

Keywords: *Bowel preparation, Colonoscopy, Colon cleaning, Patient education*

2.Introduction:

Colonoscopy is a diagnostic procedure that examines the lining of the large intestine (colon) using a flexible fiberoptic colonoscope introduced into the rectum. (Fitzmaurice et al., 2015; Torre et al., 2015). Colonoscopy is essential in diagnosing a variety of conditions as patients with a history of lower abdominal pain, constipation, persistent rectal bleeding, and diarrhea but it is most commonly used in the prevention and detection of colon cancer to examine the colon, to allow direct visualization of mucosal abnormalities and also used to perform mucosal biopsies and therapeutic procedures (Hreńczuk & Sidorczuk, 2022). There are well-defined contraindications for using endoscopy in lower gastrointestinal tract examination which include firstly inadequate or poor bowel preparations, uncooperative patients, and poor general medical conditions for example pulmonary embolism or recent myocardial infarction (Elvas et al., 2017).

Adequacy of bowel preparation is considered one of the greatest significant quality criteria that impact colonoscopy

success. (Schottinger et al., 2022). It can help to decrease the time of the procedure, increase the detection of polyp, and subsequently increase the rate of adenoma detection. For the majority of patients, bowel preparation is safe and efficacious. Moreover, it has many different properties such as cost-effectiveness, cleansing the bowel rapidly, and is not associated with substantial patient discomfort or electrolyte disturbance. Missing of small or flat lesions may be a result of suboptimal bowel preparation (Maida et al., 2019). Longer procedure time, increase incidence of interval cancer, and shortened surveillance times (Hreńczuk & Sidorczuk, 2022). Significant impediment in the progression of the colonoscope, higher complications probability, increase need for repeated examination and further sedatives and analgesics being administered (Elvas et al., 2017). There are factors related to patient which affect bowel preparation adequacy, including inpatient status, constipation, and cleansing instructions noncompliance (Smith et al., 2012; Ibáñez et al., 2011).

Colonoscopy success depends on colon preparation. Adequate cleaning of the colon makes the visualization better and saves the procedure time (Bechtold, Mir, Puli, & Nguyen, 2016). Educating patient about bowel preparation enhance compliance with bowel cleansing protocols, dietary restriction a low-residue diet, rather than a clear liquid diet, adjustments in timing and type of bowel preparations prior to colonoscopy , pre assessment for history some chronic disease, history of any medication administration. Moreover, the quality of bowel preparation is significantly improved by effective education. Nurse plays an important role in patient counseling and education accompanied by written instructions which should be simplified and easily followed (Gimeno-García et al., 2019; Rosenfeld, Krygier, Enns, Singham, Wiesinger, & Bressler, 2010). Therefore, this study was carried out to evaluate the effect of educational intervention on the knowledge and quality of bowel preparation for patients scheduled for colonoscopy.

2.1 Significant of the study:

In terms of prevalence worldwide, color ectal cancer is ranked second among women and third among men. It is the top of the three neoplasms that most commonly affect patients around the world. Recently, colonoscopy has become a widespread screening test for colon cancer prevention, as well as a diagnostic and therapeutic tool. However, approximately 20-30% of patients exist with an inadequately prepared colon during the procedure owing to patient unawareness of its importance and poor adherence to instructions; This can have a greater economic effect by extending the procedure duration and prolonged hospital stay. Also, clients who undergo colonoscopy required specific nursing preparations to enhance bowel cleanliness quality and reduce risks and complications incidence (Chang, et al., 2015; Ahmed, Makkawy, & Sayed, 2016).

2.2 Aim of the Study

Evaluate Effect of Educational Intervention on Quality of Bowel Preparation for Patients Scheduled for Colonoscopy

2.3 Research hypothesis:

The following research hypothesis was formulated:

1. Quality of bowel cleansing for study group will be improved than control group.
2. Incidence of colonoscopy problems and complications will be decreased for the study group than the control group.
3. Level of knowledge for study group will be improved than control group.
4. Patient satisfaction score will be higher for study group than control group.

3. Subjects and Methods

3.1 Research design:

Quasi-experimental two groups research design was used in this study to establish the effect relationship between independent and dependent variable, evaluate the intervention without randomization (Maciejewski, 2020).

3.2 Study setting:

The study was carried out at Gastrointestinal Endoscopy unit at Cardiac and Gastrointestinal Center - Domyata, Egypt.

3.3 Sample size:

The sample size was calculated using G power program using the following data: effect size 0.5, α error prop 0.05, one tail, power (1- β err prop) 86 % using in dependent t test to detect difference between two dependent means. Sample size is 120 patients who were classified into two equal groups each group included 60 patients.

3.4 Subjects:

A purposive sample of 120 patients who had scheduled for colonoscopy in the above-mentioned setting were recruited and divided into two equal groups randomly (control and study group). Study group have consisted of 60 patients receiving their colonoscopy preparations as an educational intervention. The control group has consisted of 60 patients receiving their colonoscopy preparations as routine hospital care. All patients in the study and control group were selected based on the following criteria: Adult patients of both genders within the age of (20- 60) years,

conscious patients who were scheduled for a colonoscopy. Patients with previous colonoscopy and uncooperative were excluded.

3.5 Tools of data collection:

The researchers used two tools for data collection as the following:

Tool I: Colonoscopy Patient assessment:

This tool was established by the researchers after reviewing of the related literature to collect baseline data for one time. It included two parts as follows:

Part (1); Demographic and medical data:

This part of tool included questions related to patient demographic characteristics such as age, gender, marital status, occupation, educational level, and residence. Besides medical data included general assessment of medical diseases, past, present, and family history, and reasons for underdoing colonoscopy.

Part (2); Knowledge assessment

regarding colonoscopy preparations; this part of tool was used to assess patient knowledge. It consisted of total (38) questions as follows: (25) questions regarding colonoscopy and (13) questions regarding colonoscopy preparation.

Scoring system: All questions had two responses, ' correct ' response was scored "ONE" and the ' incorrect ' response was scored "ZERO". The total knowledge score is the sum of scores obtained for each question, the maximum score for colorectal cancer and colonoscopy preparation was 38 score. Depending on the used scoring system, the total knowledge level was categorized as follows: poor level is < 50% with score (19); fair level 50: < 75% with score (19: < 28.5); and good level was ≥ 75% with score (≥ 28.5) (Hamed, 2014).

Tool II: Quality of Bowel Preparation

Assessment: It included three parts as follows:

Part II: Boston Bowel Preparation Scale (BBPS) (2010); It was structured by the section of gastroenterology at BMC, and issued in Gastrointestinal Endoscopy Journal in October 2010. It is a standard tool for cleaning international index colon throughout colonoscopy and was used to assess the quality

of bowel preparation for colonoscopy and presented accuracy level. It was used for one-time post colonoscopy to assess two main point characteristics of the stool and mucosal visualization as follows: clear/entire mucosa (score 3); minimal residual / most of the mucosa (score 2); residual stool, liquid/ part of mucosa (score 1); solid stool/ not seen (score 0) for each of the 3 segments of the colon (Lorenzo-Zúñiga, Moreno-de-Vega, & Boix, 2012).

Scoring system: It included a 4-point rating system (0-3) applied to each of the 3 segments of the colon (right, transverse, and left). The three segment scores are summed for a total BBPS score of (0-9), where (0) is the minimum BBPS score for an unprepared colon and (9) is the maximum BBPS score for a completely clean colon without any residual liquid. The total level of BBPS scale was categorized as follows: Excellent for more than 7 degrees, Fair from 4-6 degrees, and Bad less than 3 degrees.

Part II: Post colonoscopy problems and complications Assessment: This part of tool was developed by the researcher for assessing problems of colonoscopy like difficulty in colon visualization or prolonged time, and canceled colonoscopy for one time at the day of colonoscopy. Post-colonoscopy complications assessment like abdominal pain and distension, chest pain, tachycardia, hypotension, bleeding, and perforation for one time at the day of colonoscopy and followed through WhatsApp for three days post colonoscopy.

Part III: Modified GHAA-9 questionnaire: The questionnaire was derived from the Group Health Association of America-9 survey for measurement endoscopy patient satisfaction. It consisted of seven close ended questions as follows: (1) rate how long they waited to get an appointment, (2) rating of the waiting time at the endoscopy facility, (3) personal manner of the endoscopic personnel and (4) the endoscopist, (5) technical skills of the endoscopist, (6) adequacy of the information provided after the procedure and (7) overall rating of the visit

(Ghouri, Aslam, Memon, Ghani, Ahmad & Memon, 2017).

Scoring system: A five-point Likert scale was assigned to each item response to grade satisfaction (1=poor, 2=fair, 3=good, 4=very good, 5=excellent). The maximum possible total satisfaction score was 35. A score of ≥ 3 considered satisfaction (favorable response). Calculation of satisfaction rate was done by using favorable responses total number divided by the total number of answers for that question.

3.6 Validity:

Study tools were examined for content validity by ten experts from both fields of medicine (4 experts) and the faculty of nursing staff (6 experts). The required modifications were done accordingly.

3.7 Reliability:

Reliability analysis of the tools were assessed by Cronbach's alpha to check the internal consistency and it was 0.954 for knowledge tool, which refers to be reliable, while it was 0.816 for patient satisfaction tool.

3.8 Pilot study:

A pilot study was conducted to assess the instruments' applicability, study feasibility, and to estimate the time required for data collection. According to the selection criteria, it was performed on 10% (12) of the total patients. All patients who took part in the pilot study were not included in the study sample. Based on pilot study results and expert opinion, some details were changed or omitted, and the final fieldwork schedule was established.

3.9 Field work:

Data collection:

- Data collection extended over six months from the beginning of April 2021 to the end of September 2021.
- The frame work of the study was conducted through three consecutive phases: assessment, implementation and evaluation phase.

1. Assessment phase:

- Patients who accepted to be involved in the study and fulfilled the inclusion

criteria were included in the study. They were divided alternatively into two equal groups.

- In this phase the researchers clarified the purpose of the study and tools components to all patients of both groups.
- All patients of control group were assessed at the day of colonoscopy before performing it. The study group patients were assessed at the time of taking colonoscopy appointment. The researchers interviewed all patients of both group at the waiting area of the above-mentioned setting to collect baseline data and assess Knowledge level using tool I.

2. The implementation phase:

Study group:

- In this phase the educational intervention regarding colonoscopy preparations was implemented and presented by the researchers in form of one session. It was provided the study group patients with general knowledge about colonoscopy such as definition, indications, contraindications, equipment, preparations and complications.
- The time of the session was arranged with the same time of patient attendance to take appointment for colonoscopy to save patient time and decrease patient overload for attendance especially for researcher.
- The patients were divided into small groups; each group consists of "two to four" patients, during the interview the researcher used videos, power point presentation, questions, and discussion to attract patients' attention and motivate them to participate.
- The interview was carried out at the previously mentioned setting during the morning shifts at the waiting areas. It was lasted for about 30 - 45 minute.
- Colored booklet which translated to Arabic was distributed to the patients and family members to be guide bout colonoscopy preparations.

- WhatsApp group was formed for continuous follow up for all patients, answer patient questions, and upload different videos regarding colonoscopy preparations until the time of colonoscopy.

Control group: Those patients receiving their colonoscopy preparations as routine hospital care.

3. The evaluation phase:

Patients of both study and control groups were evaluated for one time using tool II for evaluating the effect of an educational intervention on quality of bowel preparations patient satisfaction and problems and complications immediately after performing colonoscopy and following the patient for three days after colonoscopy using tool (II), through a comparison between study and control group.

After finishing the data collection, the control groups were interviewed and instructed about all items of colonoscopy preparations as well as colored Arabic booklet was distributed to those patients to be guide for another time.

3.10 Ethical Considerations:

- An official approval was obtained from the administrative authorities prior to conducting the study after clarification of its purpose.
- Confidentiality and informed consent were assured. Confidentiality was accomplished by using closed sheets and participants' names were replaced by numbers.
- The researcher emphasized that all information provided throughout the study will be confidential and will be utilized only for statistical purposes.
- Informed consent was gained from all participants' staff after explaining the purpose of the study, before participating in the research.
- Participants were told that their participation in the study is voluntary and

they are able to discontinue whenever they want.

- No personal participant's information will remain and the results would be presented as group data.

3.11 Statistical Analysis:

SPSS for windows version 25.0 (SPSS, Chicago, IL) was used to make all statistical tests were conducted using. Categorical data were presented in frequency and percentage. Student's t test for two variables with continuous data was used for the comparisons, Chi-square test was used for the comparison of variables with categorical data. Continuous data were normally distributed and were expressed in mean \pm standard deviation (SD). For the assessment of the inter-relationships among quantitative variables Pearson correlation analysis was used. To determine the independent predictors of the patients' knowledge, and satisfaction & Boston Bowl, multiple linear regression analysis was utilized after testing normal distribution, normality, and analysis of variance for the full regression models were completed. P value at <0.05 is considered statistically significant.

4.Result:

Table (1) illustrated that, more than half of the studies groups were males (60 % & 53.3) respectively. Approximately half of patients in study and control group (50% & 43.3%) respectively were in age group of 51-60 years. More than two third of the studies groups were married (66.7% & 70%) respectively, also more than half of the studies groups were not work (63.3% & 58.3%), secondary education represent high percentage in study and control group (48.4% & 63.4%). Diabetes, heart disease, chest disease and chronic constipation were more prevalence among studied groups. No statistical significance difference was put into evidence.

Table (1): Demographic and Medical Characteristics of the Studied Groups (N= 120)

Items	Study group N= 60		Control group N= 60	
	No	%	No	%
Gender				
• Male	36	60	32	53.3
• Female	24	40	28	46.7
Age group (years)				
• 20-30	2	3.3	6	10
• 31-40	6	10	12	20
• 41-50	22	36.7	16	26.7
• 51-60	30	50	26	43.3
Marital status				
• Single	4	6.7	0	0
• Married	40	66.7	42	70
• Divorced	4	6.7	4	6.7
• Widow	12	20	14	23.3
Occupation				
• Work	22	36.7	25	41.7
• Not work	38	63.3	35	58.3
Education				
• Postgraduate	5	8.3	5	8.3
• University	12	20	9	15
• Secondary	29	48.4	38	63.4
• Illiterate	14	23.3	8	13.3
Residence				
• Rural	40	66.7	35	58.3
• Urban	20	33.3	25	41.7
Chronic disease				
• Diabetes mellitus	20	33.3	22	36.7
• Heart diseases	20	33.3	42	70
• Chest diseases	6	10	52	86.7
• Chronic constipation	24	40	20	33.3

Figure (1) represented that about three quarters of the study group (75%) had good total knowledge level related to colonoscopy preparations compare to more than half (56.7%) of the control group had poor total knowledge level related to colonoscopy preparations with a highly statistically significant improvement in total knowledge level related to colonoscopy preparations.

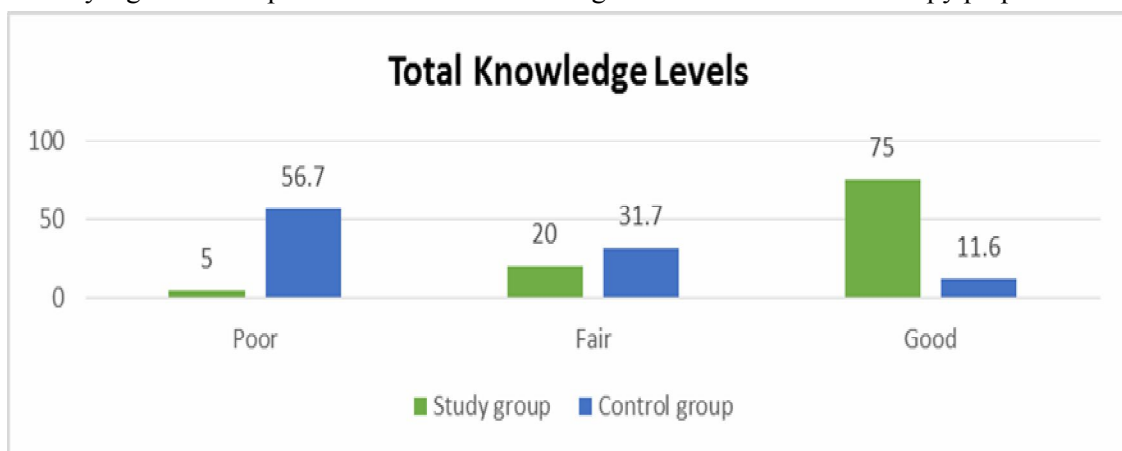


Figure 1. Total Patients' Knowledge Levels Regarding Colonoscopy Preparation (N=120).

Figure (2) illustrated comparison between studies groups in relation to quality of bowel preparations as measured by Boston Bowl Scale, it show that a highly statistically significant difference in quality of bowel preparations and cleanliness for colonoscopy between study and control group.

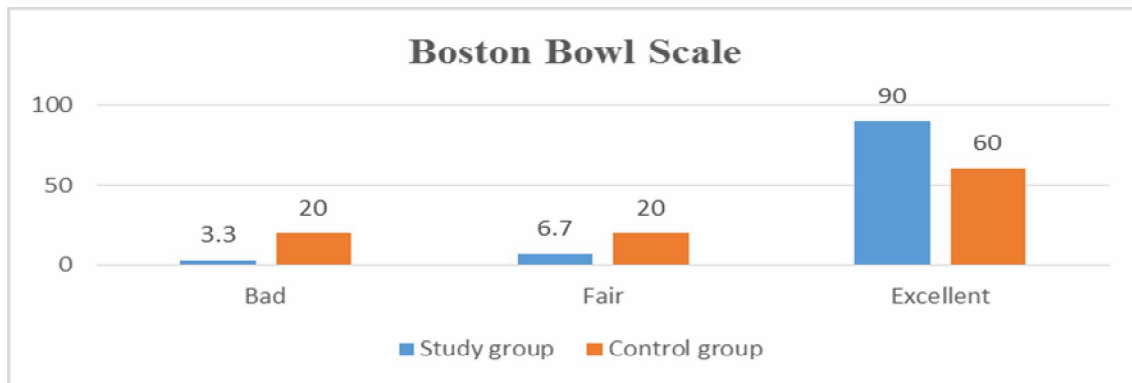


Figure 2. Comparison between Studies Groups in Relation to Quality of Bowel Preparations as Measured by Boston Bowl Scale (N=120).

Table (2) illustrates statistical significant difference between study and control groups of patient's intra and post colonoscopy related to difficult visualization of the colon (3.35%&13.3%), abdominal distension(20%&66.7%) and

hypotension(26.7%&46.7%). While the number of patients suffering from pain is still high(81.7%& 96.7) respectively. Furthermore, cancelled colonoscopy and tachycardia show decrease in the incidence with no statistical significant difference.

Table (2): Distribution of problems and complications of patients' intra and post colonoscopy (N=120).

Items		Study group		Control group		Significance
		No	%	No	%	
Problems	Difficult visualization of the colon and prolonged time of colonoscopy					$X^2 = 3.927$ $p = 0.047^*$
	• No	58	96.7	52	86.7	
	• Yes	2	3.3	8	13.3	
Problems	Cancelled colonoscopy					$X^2 = 1.481$ $p = 0.181$
	• No	56	93.3	52	86.7	
	• Yes	4	6.7	8	13.3	
Complications	Abdominal pain or discomfort					$X^2 = 6.988$ $p = 0.008^*$
	• No	11	18.3	2	3.3	
	• Yes	49	81.7	58	96.7	
	Abdominal distension (bloating)					$X^2 = 26.606$ $p = 0.000^{**}$
• No	48	80	20	33.3		
	• Yes	12	20	40	66.7	
Complications	Hypotension					$X^2 = 5.167$ $p = 0.018^*$
	• No	44	73.3	32	53.3	
	• Yes	16	26.7	28	46.7	
Complications	Tachycardia					$X^2 = 0.833$ $p = 0.247$
	• No	50	83.3	46	76.7	
	• Yes	10	16.7	14	23.3	

Table (3) shows difference between study and control group regarding patient satisfaction, it clear that statistically significant

correlation between study and control group in relation to patient satisfaction ($p=0.000^{**}$).

Table (3): patient satisfaction between study and control group (N=120)

Items	Control		Study	
	N	%	N	%
Un-satisfaction (Unfavorable Response)	7	11.7	1	1.7
Satisfaction (Favorable Response)	53	88.3	59	98.3

Table (4) illustrates a highly statistical significant relation between problems and complications that happened intra or post colonoscopy and total score categories of Boston bowel preparation scale that used to measure quality of bowel preparations among studied groups.

Problems/complications	Study group			Control group			Significance
	Bad	Fair	Excellent	Bad	Fair	Excellent	
Difficult visualization And prolonged time	0(0)	1 (1.7)	1 (1.7)	6(10)	1 (1.7)	1 (1.7)	X ² = 23.547 P=0.000**
Cancelled	1 (1.7)	3(5)	0(0)	0(0)	7(11.7)	1 (1.7)	
Abdominal pain	2(3.3)	4(6.7)	46(76.7)	12(20)	12(20)	34(65.7)	
Abdominal distension	1 (1.7)	4(6.7)	10(16.7)	9(15)	11(18.3)	20(33.3)	
Hypotension	2(3.3)	4(6.7)	12(20)	8(13.3)	6(10)	14(23.3)	
Tachycardia	1 (1.7)	2(3.3)	7(11.7)	6(10)	0(0)	8(13.3)	

Table (4) Relation between problems, complications of studied groups and Boston bowel preparation scale.

Table (5) shows multilinear regression between total knowledge score in relation to colonoscopy preparations and quality of bowel preparations as measured by Boston bowel preparation on patient satisfaction among

studied groups, it show positive relation between knowledge, good bowel preparation and patients satisfaction with significant significance difference between study and control group ($p=0.001^*$).

Table (5): Multilinear regression between total patient knowledge, Boston bowl scale and satisfaction.

Group	Items	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
Study group	Total knowledge score	-.081	.161	-.060	-.504	0.001*
	Boston bowel preparation	.903	.246	.440	3.676	0.001*
Control group	Total knowledge score	-.104	.047	-.285	-2.207	0.616
	Boston bowel preparation	.491	.147	.433	3.346	0.001*

4. Discussion

Colonoscopy is the standard modality for screening and detecting colorectal cancer among the high-risk general population (Urban et al., 2018). Colorectal cancer detection rate is significantly associated with bowel cleansing (Cavicchi et al., 2019; Hassan et al., 2019). in order to observe intestinal mucosa clearly, optimal bowel preparation is highly recommended as inadequate bowel preparation makes the procedure more difficult, interferes with the

endoscopes' judgment, lowers lesions detection rate and lead to poor compliance from patient. There are many factors linked to the quality of bowel preparation and cleanliness such as age, sex, level of educational, personal preference, knowledge level, and patient income. This result highlights the significance of patients' education and motivation to enhance and increase compliance and find better bowel cleansing during colonoscopy (Abudeeb, Khan, Maung, Malcomson, & Brown, 2019). Therefore, this study was conducted to evaluate the effect of

educational intervention on knowledge, satisfaction and quality of bowel preparation for patients scheduled for colonoscopy.

The findings of this study illustrated that more than half of the studied patients were males. In the same line with the study findings, **Voiosu et al., (2013)** informed that more than half of the patients in their study were males. This result contradicted with **Chen et al., (2021)** who mentioned that half of the studied patient were group were female. Concerning age group approximately half of studied patients ranging in age between fifty one to sixty years. This finding matched with **Padmanabhan et al., (2016)** ; **Shieh et al., (2013)** who mentioned that the mean age was fifty one point seven years. This might be related to most of studied patient diagnosed as colorectal cancer which is the third most common cancer in men and women in people older than fifty year.

Regarding marital status, education level and occupation, more than half of studied patients were married, have secondary level of education and not work. This result in the same line with **Ahmed, Makkawy, & Sayed, (2016)** who stated that one-third of patients have secondary education level and were housewives in both routine nursing instruction group and nursing educational booklet group. The present study results are in contrast with **Voiosu et al., (2013)** who declared that more than one-third of participants graduated from secondary school, more than one-third were highly education and less than one-third of participants had attended only elementary school.

The result of this study represented that about three quarters of the study group had good total knowledge level related to colonoscopy and its preparations, while more than half of the control group had poor total knowledge level post educational intervention with a highly statistically significant. This in the same line with **Abuadas & Abuadas, (2019)** revealed that the mean of the knowledge level in the intervention group subsequent to the intervention was significantly higher than that for the control

group. Correcting the knowledge gap play a significant role in enabling early detection as a primary prevention measure.

The results of the current study showed that more than three quarter of study group had excellent quality of bowel cleanliness as measured by Boston bowel scale post educational intervention compared to half of control group as measured by Boston bowel scale post routine hospital care with highly statistically significant in quality of bowel preparations and cleanliness for colonoscopy. Moreover, this study stated that twenty percent of control group had fair and poor quality of bowel cleanliness compared to three percent of study group. This result in harmony with **Ahmed et al., (2016)** clarified that more than half of participants in the routine instructions group experienced a bad bowel cleanliness level, and more than half of participants in the educational booklet and both video and booklet group have an excellent bowel cleanliness level with a highly statistically significant difference in the cleansing level of the colon of studied patients undergoing colonoscopy.

On the other hand, **Kurlander et al., (2016)** reported that compared to usual care, patient education interventions seem efficacious in improving the quality of bowel preparation. Boston bowel scale revealed significant increased adequate preparations (good and excellent) in patients undergoing colonoscopy from thirty-five percent in the control group to six percent in the intervention group, and less than half of the participants had "fair" or "poor" bowel preparation **Elvas et al., (2017)**. Even though this might appear like a very high rate for inadequate preparation, simple visual aid representing the difference between good and poor bowel preparations didn't have a remarkable effect on the quality of the preparation or other clinically relevant results such as rates of polyp detection **Calderwood, Lai, Fix, & Jacobson, (2011)**

These results from the researcher's point of view can be contributed to continues education with different instructional media through affricative booklets with different

pictures and videos with face to face discussion affords patients the opportunity to learn and advance their own techniques in self-care, improve knowledge which affects quality of bowel preparation for patients undergoing colonoscopy especially in patients are at a high risk of poor bowel preparation that discovered during assessing medical data.

Problems and complications of patients' intra and post-colonoscopy, the result of this study illustrated significant difference between study and control groups of patients' intra and post colonoscopy due to difficult colon visualization, abdominal pain or discomfort, abdominal distension and hypotension, but the number of patients suffering from pain is still high. Furthermore, cancelled colonoscopy and tachycardia show a decrease in the incidence with no statistically significant difference. This result is in harmony with **Allen, Shaw, Jong, Behrens, & Skinner, (2015)** who reported that patients undergoing both gastroscopy and colonoscopy are more prone to have pain for longer and require over-the-counter analgesics. Furthermore, **Chen, Wu, Yao, Yang, Zhao, & Qiu, (2015)** revealed that the development of abdominal pain or distension after colonoscopy considered a common phenomenon in clinical practice, progression has been achieved by replacing the insufflated air with carbon dioxide. Decrease in both frequency and intensity of post-procedural abdominal pain. **Latos, et al (2022) [17]**. Disagree with the result of this study, the literature doesn't display data about complications frequency and type in colonoscopy preparation period.

These results from the researcher's point of view may be related to assessing the factors that can affect on quality bowel preparation such as any preexisting constipation, chronic disease, family or past history. Improve patient knowledge regarding guidelines of bowel preparation through educational intervention. Increase patient self-esteem and satisfaction. All of these factors allow decreasing problems and complications associated with colposcopy and provide close monitoring of patients with specific alterations and minimize potential risk.

Patient satisfaction and experience have come under higher scrutiny level. This is related to the need for additional endoscopy to evaluate the effectiveness of treatment or disease. Patient feedback and education may result in higher standards, enhanced endoscopic performance and accountability, improved risk management, and improved care quality. Educational intervention helps satisfied patients to adhere to medication schedules and continue to use medical services and individual care providers **Loftus (2013)** This is supported by the result of this study, that there is a statistically significant correlation between both the study group and control group in relation to patient satisfaction post educational intervention.

These results from the researcher's point of view may be related to educational intervention and teamwork of health care workers that was evidenced to be associated with staff personal manner in the endoscopy unit, time spent to explain the procedure, rating of the environment of the endoscopy suite and controlling pain during the procedure.

The high frequency and variety of described adverse events associated with intestinal cleaning and the likelihood of severe and serious complications is the weight of the problem being raised. It is important to individualize qualifications as choosing preparation means and methods involving hospitalization necessity and evaluating its course. This in the same line with **Latos, et al., (2022)** whose results reported a statistically significant relation between problems and complications that happened intra or post colonoscopy and total score categories of Boston bowel preparation scale that used to measure quality of bowel preparations among studied groups.

The result of this study reported a significant correlation between total knowledge related to colonoscopy and its preparations, quality of bowel preparations as measured by Boston bowel preparation and patient satisfaction. This result in the same line with **Danielsen, Burcharth, & Rosenberg, (2013)** who clarified that educational materials

is worked as a verbal communication reinforcement tool to increase patients' knowledge, satisfaction, compliance to treatment, and for self-care stimulation.

The result of this study highlighted multilinear regression between total knowledge score in relation to colonoscopy and its preparations and quality of bowel preparations as measured by Boston bowel preparation on patient satisfaction among study group with significant significance. This result matched with **Erdoğan, Çaycı, Tardu, Arslan, Demirci & Yıldırım, (2020)** who noted a significant linear relationship between disease prevention and health promotion index, the cleanliness of the colonic segments, and the total Boston bowel preparation scale score. Health literacy level affects the quality of colonoscopy bowel preparations. On the other side **Aranda-Hernández, Hwang, & Kandel, (2016); Clark, Rustagi, & Laine, (2014)** mentioned that even though several searches have reported a non-linear relationship with prep quality previously.

In this study, the results showed that, there were highly statistical significant improvement of knowledge, quality of bowel preparation, and satisfaction among studied patients following educational intervention. Finally, continuous educational intervention is necessary to enhance quality of bowel cleanliness and knowledge, and reduce the cost health care.

6 Conclusion:

Based on the present study findings, it can be concluded that:

- Highly statistically significant improvement in total knowledge level related to colonoscopy and its preparations and quality of bowel preparations and cleanliness as measured by Boston bowel scale post educational intervention.
- Statistically significant correlation between both study and control group in relation to patient satisfaction.
- Significant correlation between total knowledge score in relation to colonoscopy and its preparations, quality

of bowel preparations as measured by Boston bowel preparation, and patient satisfaction.

7. Recommendation

Based on the findings of this study, the following recommendations are suggested:

- Written visual information about proper colonoscopy bowel preparation facilitates patient education and improves the quality of bowel cleanliness.
- Adequate information regarding potential complications signs and symptoms and the emphasis on rapid medical advice seeking.
- Determine barriers that affect the quality of bowel preparation.
- All nurses should be trained on how to use different instructional methods in education.

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