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Standardized diet and it's effectiveness on the occurrence of constipation among post open heart surgery patients

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Abstract
Background: Constipation is a common issue for patients who have undergone open-heart surgery. It can cause prolonged hospital stays and increasing morbidity. Early interventions by standardized diet and fluids are essential preventive strategies.
Objective: This study aimed to evaluate the standardized diet and its effectiveness on the occurrence of constipation among post open heart surgery patients.
Methods: A quasi-experimental study was conducted with 90 adult post-open-heart surgery patients, categorized into 2 groups: a study group (no.= 45) and a control group (no.= 45). The research was conducted at the Cardiothoracic Surgery Unit of Minia University Hospital, Egypt.
Tools: Data were collected using three primary tools: a structured interview sheet, a bowel assessment sheet (Constipation Assessment Scale and Bristol Stool Form Scale), and an intake and output chart.
Results: The study group which received standard diet for constipation includes 22–34 grams of fiber and at least 1.8 liters of fluids daily, showed a significantly lower incidence of constipation compared to the control group by the tenth day post-surgery ($p< 0.01$). At the day 10, 100% of the study group was constipation-free compared to 24.4% in the control group.
Conclusion: Standardized diet and fluids are effective and safe interventions for reducing constipation in post-open-heart surgery patients.
Recommendation: Standardized diet and fluids should be routinely integrated into the care of open-heart patients to prevent constipation.

Keywords: Standardized diet, effectiveness constipation, open-heart surgery

Introduction

After heart surgery, patients frequently experience gastrointestinal issues. The most common issue is constipation, which can be caused by a number of circumstances, such as dehydration, inadequate diet, immobilization, and adverse effects from analgesics [6, 67]. However, previous research has not focused on the problem. Patients experience nausea, vomiting, distention, and discomfort in their abdomens as a result. The sternotomy incision sustains damage as a result of these symptoms. These issues may therefore postpone the start of phase-two cardiac rehabilitation or perhaps lengthen hospital stays [40].

Open heart surgery is a last alternative for individuals whose heart problems cannot be treated with other options. It can be utilized to manage a number of heart disorders, involving coronary artery disease, arrhythmias, aneurysms, failure of the heart, as well as heart valve disease [56]. It includes valve replacement or repair in addition to coronary artery bypass surgery [68].

Constipation is characterized by a decrease in the number of intestinal movements, which results in a decrease in the frequency movements of bowel and an increase in the hardness of the stool [4, 40]. One of the most prevalent gastrointestinal issues, particularly in patients who are very sick, is constipation. It can have a major effect on people in a number of areas, such as their finances, psychological health, and physical health [40].

Constipation has been linked to anxiety and a negative perception of one's health. It can result in complications like sigmoid volvulus, colonic pseudo-obstruction, rectal prolapse, fecal impaction, overflow incontinence, urinary retention, and infection. Additionally, constipation has a significant financial impact on the healthcare system; approximately 820

million dollars are spent on laxatives annually in the United States [62]. Patients' quality of life is negatively impacted by constipation because they experience both physical symptoms and psychological distress [61].

The initial line of treatment for constipation is nonpharmacologic. This method depends on teaching patients about toilet training, physical activity, fluid intake, and a high-fiber diet. Constipation is more likely to occur when fiber consumption is low [46]. Drinking adequate water and other liquids aids in digestion and nutrition absorption, making it essential for overall health. Additionally, fluid softens feces, preventing constipation. Constipation can therefore be avoided by consuming eight to ten glasses of water daily. At least 1.8 liters of fluid per day are required for adequate hydration and regular bowel motions. Sex and body size can affect the precise quantity [42].

A nutritious diet must include fiber. Diets high in fiber increase heart health and metabolism, lower cholesterol, assist regulate blood sugar, and help people reach a healthy weight. Dietary fiber controls bacterial flora and encourages bowel movements [36]. In conclusion, dietary fiber not only raises the volume and water content of feces, which speeds up intestinal transmission and causes more frequent bowel movements, but it also encourages the growth of good intestinal bacteria and maintains the equilibrium of intestinal flora [53].

The recommended daily intake of fiber for people varies by age and sex and ranges from 22 to 34 grams [57]. Additionally, the following fiber intakes are recommended by the USDA's Dietary Guidelines for Americans Trusted Source: Women under 50 require 25–28 grams daily, men under 50 require 31–34 grams daily, women over 51 require 22 grams daily, and men over 51 require 28 grams daily [3].

Generally, fiber is categorized as either soluble, which indicate it water dissolves, or insoluble, which indicate it doesn't [37]. Fiber passes through the stomach and into the colon, where it is ingested by the beneficial bacteria in the gut, in contrast to other foods that are processed in the stomach. Consequently, eating a lot of fiber and various types of it suggests that these good, healthy gut bacteria will have an abundance of food to eat [10]. Legumes (Beans' black, beans' kidney, lentils), fruits (As oranges, berries, skin-on apples, pears), vegetables (As broccoli, green peas, carrots,), nuts (As peanuts, almonds, as well as pecans), and all grains (Whole wheat bread, pasta, oatmeal, and bran flake cereals) are all sources of fiber [26].

By using non-pharmacological therapies that improve physiological and psychological outcomes, nurses play an effective role in pre as well as post-operative care [55]. In long-term care settings, nurses are the first clinicians to use non-pharmacological therapies to alleviate constipation in adults by increasing dietary fiber and fluid intake [21]. The primary responsibility of nurses in critical care settings is to monitor and record bowel activity, which is crucial for evaluating patient recovery and spotting complications. They can also help patients avoid constipation by using strategies like increasing their intake of fluids and fiber in their diet [9, 22].

Significance of the study

Constipation frequency varies over the world, but in Makkah, Saudi Arabia, it is comparatively high among the general population at 22% (7). Constipation can complicate treatment regimens and lengthen hospital stays, making it a serious clinical concern (6). Globally, the prevalence of constipation ranges greatly, from 0.7% to 79.0%, with women experiencing higher rates than males on average (40).

Approximately 397,000 coronary artery bypass graft (CABG) as well as 106,000 valve surgeries were carried out in the United States alone in 2010, and approximately 52,000 CABG as well as 32,000 valve surgeries were carried out in Germany in 2015 (70). Open heart surgery is one common serious surgical procedure in general hospitals worldwide. The frequency of cardiovascular surgeries, which range from intricate valve replacements and other interventions to coronary artery bypass grafting, emphasizes the significance of these procedures in treating illnesses such as CAD and valvular disease [35].

Bacterial overgrowth in the digestive system, which damages the colon mucosa as well as tolerance to an enteral nourishment, is one of the many problems that can arise from constipation in critically ill patients [65]. This can make clinical care more difficult as well as has a major impact on quality of life [44]. Constipation occurs in 39 percent of people who have had heart surgery, and in 80% of these patients, constipation occurred before the procedure [34].

The study aims

This study aimed to examine the standardized diet and its effectiveness on the occurrence of constipation among post open heart surgery patients.

Research hypotheses

The current study hypothesizes that

Ha: Constipation will occur less frequently in people who consume the standardized diet than in those who do not.

Operational definitions

- **Standardized diet:** Consuming a high-fiber diet and drinking enough water are key ways to prevent constipation. A daily consumption of 22 to 34 grams of fiber and at least 1.8 liters of fluids are recommended.
- **Subjects and Methods:** This study was conducted using four main designs as: The Technical, the Operational, the Administrative, as well as Statistical.

I. The Technical design

It encompassed research design, setting, subjects, as well as tools for data collection.

Research Design: To fulfill the purpose of this study, a quasi-experimental research design was employed.

Setting: The study was conducted at the Cardiothoracic Surgery Unit in the Cardiothoracic Surgery Hospital of Minia University Hospitals, located in Minia Governorate in Egypt.

Subjects: A purposive sample composed of 90 adult patients, aged 18 to 60 years from two genders, who were admitted to the specified setting through the study time, met the inclusion criteria as well as accepted to share in the research. They were then randomly classified into two equal groups of 45 patients. Initially, patients were randomly given to the study group, followed by the control group. The required sample size was calculated using the (Isaac & Michael, 1995) [33] formula, computed as (N= n x 30 / 100) in which N = Sample size n = Total number of 150 adult patients with open heart surgery at Minia University Hospital during the period 2021:2022. N = 150 x 30 / 100 = 45 Patient. Group I (The control group) was revealed to routine hospital care, while Group II (the study group) was exposed to standardized diet and fluids.

Inclusion Criteria: participants had to fulfill the following requirements: Patients must be between the ages of 18 and 60, be of either sex, be undergoing open heart surgery, be willing to take part in the study, be unconscious, receive enteral feeding, and remain in the hospital.

Exclusion Criteria: Patients who received sedatives or muscle relaxants, had undergone bowel surgery, had a bowel problem, or complained of chronic constipation (Not reacting to simple therapeutic meals or dietary fibers) were excluded.

Data Collection tools
The current study collected data using three tools: An assessment sheet, Bowel assessment sheet, Intake and Output chart.

Tool I: Assessment sheet divided into 2 parts
This tool prepared by the researcher post the literature review Akter *et al*. & Zhu Panpan &Tegegen [5, 58, 69], utilized to assess medical and demographic information about patients.

- **Part 1: Demographic data:** such as patients' marital status, gender, age, education, as well as occupation.
- **Part II: Medical data:** This includes the following: current diagnosis, previous medical history, admission date, length of stay in the cardiothoracic unit, mobility status, current medication history, etc.

Tool II: Bowel Assessment Sheet divided into 2 parts
Part I: Constipation Assessment Scale (CAS)
Adopted from Abd-Elraheem *et al*. [1] this tool is used to evaluate the patient's bowel condition. It consists of " 8" items that focus on constipation symptoms: change in the amount of gases passed rectally, abdominal distension or bloating, oozing liquid stool, less frequent bowel movements, rectal fullness or pressure, smaller stool size, rectal pain with bowel movement, urge but inability to pass stool, and smaller stool size.

The following will be the tool's score system
The total score ranges between 0:16, a score from 0:1 No problem, a score of 2:6 display mild constipation, a score of 7:10 display moderate constipation, and a score from 11:16 display severe constipation.

Part II: Bristol Stool Form Scale (BSFS): This part aims to assess the bowel condition. This tool was adopted from Bedawy *et al*. [12] Using a diagnostic scale, the following forms of human stool are divided into 7 different groups. Type one: distinct hard lumps that resemble metal and are difficult to pass; Type two: sausage-shaped but lumpy; Type three: similar to sausage but with surface cracks; Type four: similar to sausage or snake, smooth and soft; Type five: soft blobs with clearly cut edges that pass easily; Type six: fluffy pieces with ragged edges, a mushy stool; finally Type seven: watery, without solid pieces.

The following will be the scale's score system
Type one and type two display constipation, as well as type three and type four are the ideal stools finally type five, type six and seven are diarrhea.

Tool III: (Intake and Output chart)
This tool adopted from Da Silva [18] used to calculate daily patients' fluid intake and output to assess the effect of fluids on constipation.

II- Operational Design

1. The phases that comprise the study design include preparation, fieldwork, pilot research, and content validity and reliability.
2. In order to create the data collection instruments, instructional guidelines, and media, the preliminary phase comprised a review of the pertinent literature and theoretical expertise.
3. As for content validity, five experts from Minia University's medical-surgical nursing staff reviewed the instruments to verify their content authenticity.

A pilot study was acted on ten percent of the entire sample (no. 9) participated in pilot research to evaluate the viability, impartiality, and usefulness of the data collection instrument. The researcher made no changes in response to the pilot trial's findings, and the patients were enrolled in the study.
As for ethical considerations, Official approval was acquired from the directors of the Minia University hospital, the cardiothoracic department, and the Faculty of Nursing's ethical committee no. (REC202313). In addition to being made aware of their choice to decline participation or to leave the study at any moment, participants gave their written and verbal agreement to take part.
The study fieldwork took place from 21th April to 22th December 2023, involved the assessment, planning, the implementation as well as evaluation phase.

A. (Assessment Phase)
1. Initial Assessment
On the first post-operative day, patients who satisfied the requirements for inclusion were split into two equal groups at random. The researcher collected demographic and medical data (Tool I) via:

- **Objective Data:** utilizing medical records to gather demographic data and investigation results (Approximately 30 minutes per patient).
- **Subjective Data:** Conducting patient interviews using Tools two and three to assess bowel status as well as severity constipation (Approximately 30 minutes per patient).

2. Daily Assessment
From the second day post-operative and continuing for ten days, patients in both groups were assessed daily using Tool II (Bowel Assessment Sheet) and Tool III (Intake and Output Chart).

Bowel Assessment Sheet: This includes the CAS and BSFS. Daily bowel assessments tracked constipation symptoms and classified stool types.

Intake and Output Chart: Monitored patients' fluid intake and output to detect imbalances and provide appropriate fluid intake instructions (Approximately 15 minutes per patient).

B. (Implementation phase)
Based on the initial assessment, standardized diet and fluids were applied to the study group (45 patients). From the second postoperative day and continued for ten days, the intervention according type of stool and day number that assessed by BSFS as follows:

At the Days 2-3: If the patient was

- **Constipated (Type one or two):** High fiber (adults

should get a diet of 22: 34 grams of fiber a day [57], increased fluids (≥3.7 L for males & ≥ 2.7 L for females daily) [66], and administration oral laxatives as doctor prescribed.
- **Ideal Stool (Type three or four):** typical diet, normal fluids.
- **Diarrhea (Type 5, 6, or 7):** normal diet with decreased fibers, and increased fluids to replace the lost fluids.

Days 4-5
- **Constipated (Type one or two):** Continued evaluate from days 2-3, plus enema with lactulose if persist constipation.
- **Ideal Stool (Type three or four):** Continued evaluate from days 2-3.
- **Diarrhea (Type five, six, or seven):** Continued evaluate from days 2-3, with oral lactulose cessation.

Days 6-7
- **Constipated (Type one or two):** Continued evaluate from days 4-5, plus referral to an internal medicine physician if persist constipation without response.
- **Ideal Stool (Type three or four):** Continued evaluate from days 4-5.
- **Diarrhea (Type five, six, or seven):** Continued evaluate from days 4-5, with oral lactulose cessation.

Days 8-10

Constipated (Type one or two): Continued evaluate from days 6-7, plus additional interventions as advised by a dietician or internal medicine physician if the condition worsened not response.

Ideal Stool (Type three or four): Continued evaluate from days 6-7, with oral lactulose cessation.

Diarrhea (Type five, six, or seven): Continued evaluate from days 6-7, with oral lactulose cessation as well as referral to a dietician or internal medicine physician if needed before discharge.

Each implementation session lasted 30-45 minutes per patient.

C. (Evaluation Phase)

Daily Evaluation: From the third to the tenth post-operative day, patients in both groups were evaluated daily using the Bowel Assessment Sheet and Intake and Output Chart to monitor constipation. Standardized diet and fluids were applied to the intervention group based on these evaluations.

Final Evaluation: On the tenth day, the final evaluation was conducted using Tools II and III. The outcomes of bowel care were compared between the control as well as study groups to assess the effectiveness of the standardized diet and fluid intake.

III. Administrative design

Official permission was taken from the Director of the Cardiothoracic care unit at Minia University Hospital is affiliated with Minia University. The researcher and nursing administration staff had a meeting and discussion to go over the research goals and objectives and figure out how to work together more efficiently throughout the implementation phase. These were essential in getting patients motivated to participate in the study.

Statistical design

Statistical methods for data analysis

The data was compiled, tabulated, and presented using descriptive statistics, which included averages, standard deviations, percentages, and frequency distribution to describe the data's range. For the statistical studies, SPSS 21 software was utilized. The mean as well as standard deviation were utilized to report statistics. Qualitative data was represented using percentages and frequencies. The probability (P-value) indicates the level of significance. A p-value of less than 0.05 was considered to be the significance level. The more important the finding, the lower the P-value (*). Highly significant was defined as less than 0.001 (**). The Pearson correlation test computed correlation coefficients to evaluate confounding risk variables. The impact of the research regimen on preventing constipation was assessed using both crude and multiple linear regression analysis. To demonstrate the outcome's independence, the key predictor's beta coefficient change was tracked to make sure it didn't rise above 20%. The regression models did not exhibit multicollinearity when multicollinearity was assessed using the variance inflation factor. The residuals had a normal distribution that was identical and independent.

Results

Table 1: Frequency Distribution of Both Study and Control Group Regarding their Demographic Data (n=90):

Demographic Data	Study (n=45)		Control (n=45)		Test of sig.	P-value
	No.	%	No.	%		
Age (yrs.)						
20: <30	5	11.1	6	13.3	X^2 =1.33	0.721
30: <40	8	17.8	5	11.1		
40: <50	7	15.6	10	22.2		
50: 60	25	55.6	24	53.3		
Mean ± SD	47.6 ± 11.7		46.5 ± 11.8		t=0.446	0.657
Gender						
Female	27	60	29	64.4	0.189	0.664
Male	18	40	16	35.6		
Marital status						
Single	5	11.1	5	11.1	2.04	0.564
Married	29	64.4	28	62.2		
Divorced	1	2.2	4	8.9		
Widowed	10	22.2	8	17.8		
Education						
Illiterate	25	55.6	20	44.4	4.67	0.198
Basic education	15	33.3	13	28.9		
Secondary	4	8.9	6	13.3		
University	1	2.2	6	13.3		
Occupation						
Working	16	35.6	8	17.8	6.24	0.054
Not Working	13	28.9	24	53.3		
Housewife	16	35.6	13	28.9		

* Statistically significant difference ($p \leq 0.05$)

Table 1: shows that the mean age of participants in the study and control groups was similar, with averages of 47.6±11.7 years and 46.5±11.8 years, respectively. Regarding gender, female, comprising 60% of the study group and 64.4% of the control group. In terms of marital status, 64.4% were married, at the study group and 62.2% for the control group. Educational levels indicated that 55.6% of the study group and 44.4% of the control group were illiterate. The results indicated no statistically significant variations in demographic traits between the study and control groups, except for occupation.

Table 2: Frequency Distribution of Both Study as well as Control Groups Regarding their Medical Data (n=90)

	Study (n=45)		Control (n=45)		X^2	P-value
	No.	%	No.	%		
Stay period						
<10 days	8	17.8	10	22.2	0.278	0.793
≥ 10 days	37	82.2	35	77.8		
Mean ± SD	11.6 ± 1.47		12.00 ± 2.14		0.802	0.424
Present diagnosis						
CABG	16	35.6	20	44.4	0.741	0.519
Valve replacement	29	64.4	25	55.6		
Past medical history						
Nothing	24	53.3	20	44.4	3.51	0.319
Hypertension & DM	12	26.7	20	44.4		
Diabetes mellitus only	2	4.4	1	2.2		
Hypertension only	7	15.6	4	8.9		
Diet: fiber intake						
Yes	18	40	15	33.3	0.431	0.512
No	27	60	30	66.7		
Current medication						
Analgesics	8	17.8	11	24.4	3.83	0.429
Laxatives	1	2.2	2	4.4		
Diuretics	3	6.7	0	0		
Analgesics, laxatives	0	0	0	0		
Analgesics, laxatives, Diuretics	6	13.3	2	4.4		
Analgesics, Diuretics	27	60	30	66.7		

* Statistically significant difference ($p \leq 0.05$) CABG=Coronary artery bypass graft DM=Diabetes mellites

Table 2: shows that the most of two groups stayed in the hospital for ten days or more 82.2% and 77.8%, respectively. Valve replacement was the most common diagnosis 64.4% in the study group and 55.6% in the control group, while CABG was less common 35.6% and 44.4%, respectively. Most participants had no past medical history 53.3% in the study group as well as 44.4% in the control group. The majority of both groups had low fiber intake 60% in the study group as well as 66.7% in the control group. The highest percentage of participants in both groups were taking analgesics and diuretics. No significant differences in medical data were found between the study as well as control groups.

Table 3: Frequency Distribution of Both Study as well as Control Group Regarding Total Score of Constipation Assessment Scale Pre and Post Intervention (n=90)

Day 1		Day 5		Day 10	
Study (n=45)	Control (n=45)	Study (n=45)	Control (n=45)	Study (n=45)	Control (n=45)
No (%)	No (%)	No (%)	No (%)	No (%)	No (%)
No problem					
23 (51.1)	16(35.6)	40(88.9)	11(24.4)	45(100)	11(24.4)
Mild constipation					
16 (35.6)	18 (40)	5(11.1)	27(60)	0(0)	23(51.1)
Moderate constipation					
4 (8.9)	5(11.1)	0(0)	7(15.6)	0(0)	5(11.1)
Severe constipation					
2 (4.4)	6(13.3)	0(0)	0(0)	0(0)	6(13.3)
X2 (p-value)					
3.48 (0.323)		38.6 (0.001**)		54.6 (0.001**)	

* Statistically significant difference ($p \leq 0.05$) ** highly statistically significant difference ($p \leq 0.01$)

Table (3) reveals that by day 10, all participants in the study group (100%) reported no constipation after fiber and fluid intake, compared to the first day. Statistically significant differences were observed between the study and control groups in the total score of the constipation assessment scale post-intervention.

Table 4: Frequency Distribution of Both Study and Control Group Regarding Bristol Stool Form Scale Pre and Post Intervention (n=90)

Day 1		Day 5		Day 10		
Study (n=45)	**Control (n=45)**	**Study (n=45)**	**Control (n=45)**	**Study (n=45)**	**Control (n=45)**	
No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	
Constipated						
17 (37.8)	14 (31.1)	3 (6.7)	21 (46.7)	0 (0)	22 (48.9)	
Ideal Stool						
27 (69)	30 (66.7)	42 (93.3)	23 (51.1)	45 (100)	23 (51.1)	35.3 (0.001**)
Diarrhea						
1 (2.2)	1 (2.2)	0 (0)	1 (2.2)	0 (0)	0 (0)	
0.448 (0.799)		20.9 (0.001**)		29.1 (0/001**)		

* Statistically significant difference ($P \leq 0.05$) ** highly statistically significant difference ($p \leq 0.01$)

Table (4) shows that the study group at day 10 hadn't had constipation at 0%, while 48.9% of the control group still experienced constipation. Ideal stool consistency was achieved by 100% of the study group, compared to 51.1% of the control group. Following the intervention, statistically significant differences between the groups were noted.

Table 5: Correlation between Fiber Intake and Presence of Constipation among Study and Groups (n=90)

	Fiber Intake							
	Day 1				Day 10			
	Study (n=45)		Control (n=45)		Study (n=45)		Control (n=45)	
	R	P	R	P	r	p	R	p
Constipation	0.020	(0.896)	-0.186	0.221	-0.311	0.038*	-0.049	0.748

* p = ≤.05 (Statistical significance). ** *p*≤.01 (highly statistical significance).

Table (5) demonstrates a statistically significant positive correlation between fiber intake and the reduction of constipation occurrence among the study group.

Table 6: Correlation between Fluid Intake and Presence of Constipation among Study and Groups (n=90)

	Fluid Intake							
	Day 1				Day 10			
	Study (n=45)		Control (n=45)		Study (n=45)		Control (n=45)	
	R	P	R	P	r	p	r	p
- Constipation	0.202	(0.183)	-0.065	0.873	-0.305	0.042*	-0.225	0.183

* p = ≤.05 (Statistical significance) ** p = ≤.01 (Highly statistical significance).

Table (6) illustrates a statistically significant positive correlation between fluid intake and the reduction of constipation occurrence among the study group.

Table 7: Multiple linear regression analysis for the association between Fiber & Fluid Intake and the Presence of Constipation among Study and Control Groups post-intervention before and after adjusting to demographic characteristics (n=90)

	R^2	Adjusted R	*β*	SE	T	F	P value
Fiber Intake							
Crude model	0.005	0.007	0.617	0.188	3.28	0.423	0.517
Multivariate model	0.381	0.072	0.630	0.466	2.59	1.98	0.067
Fluid Intake							
Crude model	0.311	0.303	0.622	0.183	3.39	39.7	0.001**
Multivariate model	0.402	0.351	0.518	0.374	2.46	7.88	0.001**

** p = ≤.01 (highly statistical significance), R2= multivariate regression. (β)= standardized coefficient, SE= Standard Erorr

Table (7) shows the crude and multivariate regression for the association between fiber & fluid intake and the presence of constipation. Fiber & fluid intake is significantly associated with constipation either alone or after adjusting for demographic characteristics with an unstandardized coefficient (*β)* at 0.617 in the crude model and 0.630 in the multivariate model for fibres intake, while *β* at 0.622 in the crude model and 0.518 in the multivariate model for fluids intake.

Discussion

After open heart surgery, constipation may overshadow the surgical outcome [45]. Due to straining during defecation and the Valsalva maneuver, which causes changes in peripheral vascular resistance, heart rate, cardiac output, as well as blood pressure, it has additional effects on patients after heart surgery, adversely affecting cardiac functioning [41]. Constipation is more likely to occur when fiber and fluid consumption are low. Dietary fibers can be either soluble or insoluble, although soluble fibers work better. Its efficiency in reducing the tenderness of defecation pain and raising stool weight, frequency, and consistency [61].

Regarding the demographic characteristics and medical data of the studied sample**,** participants in this study demonstrate a balanced distribution across the study and control groups, providing a solid foundation for evaluating the effect of the high-fiber diet and fluids intake on constipation among open-heart surgery patients.

Regarding the demographic characteristics as well as medical data of the participants, the mean age of participants in the control and study groups they were in the middle age group at 40 years of age, respectively. This age similarity points to one of the age-related risk factors for open heart surgery. In Egypt, age is mostly correlated with atherosclerosis and hypertension, two major risk factors for coronary artery bypass grafts (CABG). This observation is consistent with research by Aluru *et al.* [8], which found that valvular heart disorders are more common as people age worldwide. Because of increased survival rates and an aging population, Coffey *et al.* and DesJardin *et al.* [15, 20] also observed an increase in the prevalence of valvular heart disease (VHD). Furthermore, Nicolini *et al.* [43] emphasized that elderly patients require cardiothoracic surgery due to age-related alterations in the blood vessels and heart.

This result is in matching with the findings of Sinha *et al.* [54] who found that women had a greater rate of revascularization procedures than men. Similarly, compared to men, women undergoing open heart surgery had higher operative mortality and morbidity, according to Voigt *et al.* [60]. Additionally, Fox & Nussmeier [27] reported that more than 410,000 cardiac procedures are carried out on American women each year, with women having CABG and valve surgeries at a higher rate than men. In the first five years following CABG, women experienced worse outcomes, according to Gaudino *et al.* [28]. Beale *et al.* [11] investigated these findings and showed that women are more affected than men because of variations in cardiac structure and function in the left ventricular (LV) function and dimensions. Women's LV chambers are smaller, which results in lower stroke volumes. Additionally, women's LV

elastance (Stiffness) is higher than men's, both systolic and diastolic.

However, some studies found that males were more likely than females to have heart surgery, and Elfagieh [23] found that men made up the majority of open-heart patients with gastrointestinal problems. Additionally, men are more likely than women to have open heart surgery, according to Yang *et al*. [64]. In addition to pregnancy and feminine hormones that cause high blood pressure and heart disease, researchers believe that women are more likely to require open heart surgery because of their hectic lifestyles and capacity to multitask.

Marital status analysis showed that the greatest percentages of participants in two groups were married. This observation is consistent with studies by Abd-Elraheem *et al* & Bedawy *et al*. [1, 12] which also found high marriage rates among cardiac surgery patients.

According to the researcher, a hectic lifestyle is exacerbated by marital responsibilities and relationship commitments. He is therefore at risk for heart disease and excessive blood pressure.

The educational level analysis revealed that nearly half of the study participants were illiterate, reflecting a low educational status. This result is consistent with Conlin & Schumann's [16] observation that patients with less formal education and a lower socioeconomic position typically have more advanced illnesses, such as heart disease. The primary cause of this is a lack of knowledge on cardiac disease risk factors and guidelines.

The influence of education on health outcomes may differ, though, since Christensen *et al*. [14] found no correlation within educational level and mortality or the danger of cardiac events after a year in the hospital. According to the study, Egyptian rural culture historically prevented people from attending or finishing their education, which resulted in a lack of awareness regarding heart disease risk factors and dangerous lifestyle choices.

Regarding diagnosis, the study showed that valve replacement was the most common procedure in the study and control group, while CABG was less frequent. According to the researcher, the reason of the tonsillitis, if left untreated or if antibiotic therapy is not completed, is a streptococcus bacterial infection, which increases the risk of rheumatic fever, which damages the heart valves.

These findings are consistent with Data Research [47] that discovered that one of the most frequent procedures carried out in the market for cardiac surgery is valve replacement. The USA cardiac surgery market is predicted to see a significant increase in procedures, surpassing 290,000 annually in 2029. The increasing prevalence of valvular heart illnesses, which afflict around 41 million individuals, especially rheumatic heart disease, in developing countries was also brought to light by Aluru *et al*. [8]. Studies by Santangelo *et al*. and DesJardin *et al*. [20, 50] support this trend. There is some variation in procedural predominance, though, as iData Research [47] also pointed out that coronary artery bypass grafting, or CABG, is the common kind of heart surgery.

In line with Milosavljevic *et al*. [40], who suggested Lactulose and PEG for the prevention of chronic constipation, medication analysis showed that neither research participants nor control groups used laxatives such Lactulose in their daily lives when necessary. Laxatives are the most often used medications for controlling and preventing constipation, according to Włodarczyk *et al*. [61].

Additionally, the most patients in the two groups obtained analgesics within the first two days following surgery, according to medication analysis. The use of analgesics after surgery was justified by this observation, which was in line with Bedawy *et al*. [12], because of the extreme discomfort at the wound site. According to the researchers, open heart surgery results in excruciating agony at the operation site, which raises blood pressure, pulse rate, and breathing. It is crucial to take analgesics after surgery because this has a negative impact on heart state.

In summary, the study's participants' baseline medical and demographic information is well-matched across the study and control groups, reducing confounding factors and improving the validity of the findings. These results support the study's methodology and offer a solid foundation for assessing how well a high-fiber diet and fluid intake can avoid making patients who are having open heart surgery constipated. They also align with recent studies conducted in comparable patient populations.

As for the Constipation Assessment Scale Pre and Post Intervention, the findings were great. The results show significant improvement in the study group regarding various symptoms of constipation from day 1 to day 10 after the implementation of the standardized diet. This result is in line with a study by Abd-Elraheem *et al*. [1] that found a significant percentage of constipation in the control group as a result of low movement and decreased fiber and fluid intake. The improved mobility, high fiber and fluid intake, and reduced opioid use may have contributed to the improvement in the intervention group. Additionally, this result is in line with research conducted by Mahran *et al*. and Bekmez [13, 38].

In the same vein, Haywood *et al*. [30] showed that loose stool is crucial for preventing problems in individuals recovering from heart surgery. According to Mahran *et al*. [38] who showed that bowel regimen protocols considerably enhance bowel function and minimize constipation in ICU patients, these results highlight the high fiber and fluid effectiveness.

The researcher believes that non-pharmacological approaches, such as a standardized diet rich in fiber and liquids, are a better way to prevent and treat constipation than pharmaceutical approaches, particularly for individuals recovering from open heart surgery.

The study group's overall constipation scores significantly decreased, according to the results of the constipation evaluation scale. Unlike the control group, where less than 25% of individuals reported no constipation by day 10, all participants reported no constipation by day 10. This result match with that of Bedawy *et al*. [12], that used these guidelines with orthopedic patients and observed a notable improvement in bowel function.

The mean constipation scores were significant improved from day 1 to day 10 in the study group, while the control group showed minimal improvement. This success corroborates the findings of McPeake *et al*. [39] who observed a decrease in constipation incidence after implementing a high fiber and fluids and mobility.

The Bristol Stool Form Scale showed great results also for pre-as well as post-intervention. The results indicate significant advances in stool consistency reach to normal stool form within the study group following the intervention. On day 1, a significant portion of the study group experienced constipation (Types 1 and 2), but by day 10, none remained constipated. This contrasts with the control group, which still showed substantial percentages of constipation by day 10. The groups' differences were statistically significant. By day 5 and day 10. These results align with Forootan *et al*. [25] who identified factors such as low fiber diet and decreased water intake as major

contributors to constipation. Stool consistency assessment by using the BSFS shows that all study group participants exhibited ideal consistency of the stool (Types 3 and 4) on day 10, while nearly half of the control group still experienced constipation. These results we reached easily by using the BSFS. Also, Yamada *et al.* [63] encourage the use of the BSFS to improve treatment for constipation by accurately monitoring stool consistency. From the researchers' point of view, good stool consistency monitoring is necessary to achieve positive effects. Therefore, the Bristol Stool Form Scale offers precise information on human stool forms that makes it simple to execute a bowel care program.

As regards Fiber diet, the results of this study in (Table 2) of medical data showed that over two-thirds of the two groups received a low-fiber diet. From the viewpoint of the researcher, the absence of dietitians on the hospital's healthcare team, the lack of nurses and patients' knowledge of the benefits of nutritional support for patients, and the failure to modify the hospital menu to meet patient needs result in post-open-heart patients not getting the right nutrients, such as enough fiber. This research raises concerns regarding the lack of literacy in the culture surrounding the promotion of a healthy lifestyle to avoid constipation. The results of Milosavljevic *et al.* [40], who suggested that patients consume 20–30 g of fiber per day in order to improve intestinal barrier function and nutritional status and avoid constipation, lend support to this view.

Continuing to support finding in (table 5) regarding releationship between high fiber intake and constipation, studies by Shen *et al.* [52] who demonstrated that nonpharmacologic management is the 1st line to prevent and treat in constipation, so educating patients about diet including fibers is necessary to avoid constipation. In addition, Ertürk and Yalçın [24] found that insufficient fiber intake is considered a risk factor for constipation. Also reported that the food groups of fibers were associated with lower constipation scores. Furthermore, the result is consistent with more than the studies of Bedawy *et al.*, [12] Abd El Kader, and Youssef [2, 12]. Also Van Der Schoot, *et al* [59]. Who observed that increasing dietary fiber to 10g/d improves response to manage of chronic constipation.

In order to prevent constipation, Ghanbari *et al.* [29] stressed the significance of teaching patients about dietary fiber. Inadequate consumption of fiber has also been recognized as a risk factor for constipation by Coss-Adame *et al.* and Rollet *et al.* [17, 48]. Abd El Kader & Youssef, Van Der Schoot *et al.* [2, 12, 59], and Bedawy *et al.* observed similar results, stating that increasing dietary fiber intake to 10 gm/day can increase responsiveness to therapy of chronic constipation.

From the researchers' point of view, a high-fiber diet should be a key component of recovery plans for patients who have had open heart surgery. This should start the day after the procedure and continue for months until the patient is fully recovered.

As regards fluid intake, Fluid intake highlighted the importance of adequate hydration in preventing constipation. The findings demonstrated that consuming enough water and other fluids helps to soften and facilitate the passage of feces. This opinion is supported by the findings of Sajitha & Kumari [49] who reported that avoiding constipation can be achieved by consuming eight to ten glasses of water daily. Also, Shaheen *et al.* [51] reported that adequate water intake daily was≥3.7 L for males and ≥ 2.7 L for females. Furthermore, Howard *et al.* [31] stated that a 4.1–6.0 L intake daily that is suggested for a healthy 70 kg adult in an dry climate.

This finding corroborated the findings of Milosavljevic *et al.* [40] who found that adequate intake of fluids (1.5–2 L/day) is important daily to avoid constipation. Further evidence supports this finding by Shen *et al.* [52] who revealed that low fluid intake, low intake of fiber, physical inactivity, and no toilet training leads to a greater probability of constipation. In addition, Ertürk and Yalçın, Abd El Kader and Youssef, Bedawy, *et al.*, and Abd-Elraheem *et al.* [1, 2, 12, 24] found that insufficient fluid intake was considered a risk factor for constipation.

By the way, Hozyasz [32] also found that lack of toilet training, physical inactivity, poor fiber intake, and low fluid intake were important factors raising the incidence of constipation.

From the perspective of the researchers, one of the most crucial components of a healthy body is fluids. After open heart surgery, the first thing to do is to make sure the patient is properly hydrated. This will help with digestion, absorption, and excretion, which will help avoid constipation.

Conclusion

The results of this research noted that standardized diet and fluids can significantly improve constipation symptoms and consistency of the stool in the study group compared to the control group. This intervention is effective across varied demographic and medical backgrounds, highlighting its potential for widespread clinical application. These findings suggest that integrating Standardized diet into routine care could enhance patient outcomes and reduce constipation-related complications.

Recommendations

1. Adoption of standardized food and fluids: In order to prevent constipation in postoperative open-heart patients, healthcare practitioners should make a high-fiber diet and increased fluid consumption part of routine care.

2. Education and Training: The significance of dietary and hydration therapies in controlling postoperative bowel health should be emphasized in nursing and healthcare professional training programs.

1. **Further Research:** Future research should examine how dietary therapies affect constipation over the long term in a range of clinical settings and patient demographics.
2. **Patient-Centered Care:** Adapting the diet and fluid intake to each patient's requirements and preferences may improve patient satisfaction and overall results.

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