Murdoch Bowel Protocol and its Effect on the Occurrence of Constipation among Open Heart Surgery Patients

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Abstract:

Background: Constipation is a common complication among patients undergoing open-heart surgery, often prolonging hospital stays and contributing to significant morbidity, with rare cases leading to mortality. The Murdoch Bowel Protocol provides a straightforward and validated approach for managing constipation. **Aim of the study:** To evaluate the effect of implementing the Murdoch Bowel Protocol on constipation among open-heart surgery patients. **Research design:** A quasi-experimental research design was utilized. **Subjects**: A purposive sample including (90) adult post-open-heart surgery patients classified into two equal groups of 45 each (study and control group). **Setting:** Conducted at Cardiothoracic Surgery Hospital of Minia University in Minia governorate. **Tools:** Three tools were utilized to collect data, the first tool is a structured interview assessment sheet for demographic and medical data, and the second tool includes a bowel assessment sheet divided into 2 parts: part I: Constipation Assessment Scale, part II: Bristol Stool Form Scale, the third tool include: Intake and Output chart. **Results:** The study group demonstrated a statistically significant difference in preventing constipation occurrence compared to the control group on the tenth day. **Conclusion:** The study findings indicate that patients who received the Murdoch bowel protocol have a lower incidence rate of constipation than those patients who didn't receive the Murdoch bowel protocol. **Recommendation:** Application of Murdoch bowel protocol to reduce the occurrence of constipation among critically ill patients in the intensive care unit.

Keywords: Constipation, Murdoch Bowel Protocol, Open-Heart Patients.

Introduction:

The Murdoch Bowel Protocol is a structured, user-friendly approach to managing constipation. It leverages the validated Bristol Stool Chart (BSC), which classifies stool into seven types to guide day-specific interventions. The protocol emphasizes collaboration among healthcare professionals, including dietitians and continence nurse specialists, to optimize care **(Ross-Adjie, 2012).** Developed through a multidisciplinary effort, it incorporates evidence-based guidelines for bowel management and has been shown to improve patient outcomes **(Bedawy et al., 2023; Ross-Adjie, 2012).**

Constipation is a significant gastrointestinal condition that severely impacts patients' quality of life, especially among critically ill individuals **(Ali et al., 2022).** Among patients undergoing open-heart surgery, constipation is a frequent complication, often overshadowing recovery due to its associated discomfort and risks. It is among the leading causes for visits to gastroenterologists **(Milosavljevic et al., 2022).** The definition of constipation can vary, but it is generally recognized as having fewer than three bowel movements per week, often accompanied by hard stools, pain during defecation, and feelings of incomplete evacuation **(Ahmed et al., 2020; Milosavljevic et al., 2022).**

Open-heart surgery, encompassing procedures like coronary artery bypass grafting (CABG) and valve repair or replacement, is

typically a last resort when other treatments for heart conditions fail **(Zhong et al., 2021).** This type of surgery is used to address various conditions, including coronary artery disease, valvular heart disease, heart failure, arrhythmias, and congenital heart defects **(Gupta, 2022).**

Constipation is a leading gastrointestinal complaint in critically ill patients **(Danielis et al., 2023)**, with effects extending beyond physical discomfort to psychological and financial burdens **(Milosavljevic et al., 2022).** In the United States alone, laxative expenditures surpass $820 million annually **(Wong et al., 2021).** Complications associated with untreated constipation include fecal impaction, overflow incontinence, sigmoid volvulus, pseudo-obstruction, rectal prolapse, urinary retention, and infections. This condition profoundly diminishes life quality, causing both physical and emotional distress **(Włodarczyk et al., 2021).**

The first step in managing constipation is adopting nonpharmacological strategies. These approaches include educating patients on dietary adjustments, increasing fiber and fluid intake, promoting physical activity, and implementing toilet-training practices. Insufficient fiber intake is a notable risk factor for constipation **(Ramos et al., 2022).** Adequate hydration, typically around 1.8 liters daily, supports bowel regularity, although individual needs may vary based on body size and gender **(Ngo-Hamilton, 2024).**

Fiber plays an essential role in promoting digestive health. High-fiber diets improve metabolism, regulate blood sugar, lower cholesterol, and support weight management. Additionally, they enhance gut health by fostering regular bowel movements and balancing gut microbiota **(Jama et al., 2024).**

Nurses are integral in the pre- and post-operative care of open-heart surgery patients, particularly in implementing nonpharmacological strategies to manage constipation. They serve as the primary professionals responsible for monitoring bowel activity and identifying complications, which are critical for assessing patient recovery **(Baldwin, 2022; Dionne et al., 2022).** In intensive care settings, bowel management protocols (BMPs) are increasingly adopted to standardize care for critically ill patients. However, surveys indicate that the utilization of these protocols remains low, emphasizing the need for evidence-based strategies to improve practices and patient outcomes **(Dionne et al., 2022).**

Significance of the Study

The prevalence of constipation is notably high worldwide, ranging from 0.7% to 79.0%, with an average of approximately 16%. Women are more commonly affected than men **(Milosavljevic et al., 2022).** In Saudi Arabia, for instance, 22% of the general population experiences constipation **(Ali et al., 2021).** Constipation not only challenges clinical management but also prolongs hospital stays, adding to healthcare costs **(Ali et al., 2022).**

Cardiac surgeries, including CABG and valve replacements, are among the most frequently performed procedures in hospitals worldwide. In the United States alone, 397,000 CABG surgeries and 106,000 valve surgeries were performed in 2010, while Germany reported 52,000 CABG and 32,000 valve surgeries in 2015 **(Ziehm et al., 2017).** These procedures are vital for managing coronary artery disease (CAD) and valvular disorders, but they are often accompanied by post-operative complications, including constipation.

The prevalence of constipation after cardiac surgery is concerning. Studies reveal that 39.2% of patients experience constipation post-surgery, with 80% already showing symptoms prior to their procedure **(Iyigun et al., 2017).** In Japan, 47% of patients hospitalized for cardiovascular diseases were found to have constipation **(Judkins et al., 2023).** These statistics highlight the critical need for effective bowel management strategies in this patient population.

Aim of the Study

The study aims to evaluate the effect of implementing the Murdoch bowel protocol on constipation among open-heart patients.

Research Hypotheses

Ha: Patients who will receive the Murdoch bowel protocol are expected to have a lower incidence rate of constipation than those patients who will not receive the Murdoch bowel protocol.

Patients and Methods

Research Design:

A Quasi-experimental research design was utilized to fulfill the aim of this study.

Setting:

This study was conducted at the Open - Heart Surgery Unit, which is located on the second floor of the hospital and contains 6 patient beds, that belong to the Cardiothoracic Surgery Hospital at Minia University Hospitals, Minia City- Egypt.

Study Duration:

Data collection took nine months, from April 21 to December 22- 2023.

Subjects:

A purposive sample of 90 adult patients, aged 18 to 60 years from both genders, who were admitted to the specified setting during the study period, met the inclusion criteria and agreed to participate. They were then randomly divided into two equal groups of 45 patients each. Initially, patients were randomly assigned to the study group, followed by the control group. The required sample size was calculated using the **(Isaac & Michael, 1995)** 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 2021:2022.

N = 150 x 30 / 100 = 45 Patient

Inclusion Criteria:

1. Adults aged 18–60 years of both sexes.
2. Patients undergoing open-heart surgery.
3. Participants willing to be part of the study during their ICU stay.
4. Those receiving enteral feeding.
5. Conscious and oriented individuals.

Exclusion Criteria:

1. Patients receiving sedatives or muscle relaxants.
2. Individuals with a history of bowel surgery.
3. Patients diagnosed with bowel disorders.
4. Those experiencing chronic constipation unresponsive to dietary fibers or simple therapeutic regimens.

Data Collection Tools:

The study utilized three tools for data collection: an assessment sheet designed by the researcher, a bowel evaluation sheet, and an intake/output chart.

Tool I: Assessment Sheet

This tool is divided into two main sections:

- **Part I: Demographic Data**: includes details such as the patient's age, gender, marital status, educational level, and occupation.
- **Part II: Medical Data: c**overs information about current diagnoses, past medical history, date of admission, duration of ICU stay, mobility status, and ongoing medication.

Tool II: Bowel Assessment Sheet

This is also subdivided into two sections:

- **Part I: Constipation Assessment Scale (CAS): t**his tool identifies bowel issues using eight items that address constipation symptoms, including abdominal distension, gas passage irregularities, decreased bowel frequency, rectal fullness, pain during defecation, oozing liquid stool, urge but inability to pass stool, and smaller stool size. **Scoring:** Total range is 0–16, while in details, every sub range has category as follows: 0–1: No issue, 2–6: Mild constipation, 7–10: Moderate constipation, and 11–16: Severe constipation
- **Part II: Bristol Stool Form Scale (BSFS):**

This diagnostic scale classifies stool into seven categories:

  - **Type 1**: Hard lumps, difficult to pass (constipation).
  - **Type 2**: Sausage-shaped but lumpy (constipation).
  - **Type 3**: Sausage-shaped with surface cracks (ideal).
  - **Type 4**: Smooth and soft sausage-like stool (ideal).
  - **Type 5**: Soft blobs, easily passed (diarrhea).
  - **Type 6**: Mushy with ragged edges (diarrhea).
  - **Type 7**: Watery with no solid pieces (diarrhea).

Tool III: Intake and Output Chart

Used to monitor and quantify patients' daily fluid intake and output, enabling the assessment of hydration's impact on bowel health.

Validity and Reliability:

The tools were reviewed by five medical-surgical nursing experts from Minia University for clarity, relevance, and comprehensiveness. Adjustments were made based on feedback. Reliability was verified using Cronbach's alpha, with a resulting score of 0.897, indicating high reliability.

Pilot Study:

A pilot test was conducted with 10% of the sample (nine patients) to ensure feasibility and applicability. The pilot revealed no need for

adjustments, and these participants were included in the study.

Ethical Considerations:

Approval was granted by the ethical committee (REC202313) of the Faculty of Nursing, Minia University. Formal permissions were also secured from the hospital's and open-heart unit's administration. Participation was voluntary, and informed oral and written consent was obtained. Patients were assured of confidentiality, anonymity, and the ability to withdraw at any point. Data was securely coded and not used for unrelated research without further consent.

Field Work:

The study was carried out in four stages from 21st April to 22nd December 2023.

Phase 1: Preparation

The researcher secured official permissions and conducted patient recruitment by visiting study settings daily during morning shifts. Participants and their families were briefed individually on the study's objectives and methods.

Phase 2: Assessment

Initial Assessment:

On the first post-operative day, patients meeting the criteria were randomly assigned to two equal groups. Data was collected through:

- **Objective Data:** Patient demographics and medical history from medical records (30 minutes per patient).
- **Subjective Data:** Bowel health and fluid balance assessed via Tools II and III (30 minutes per patient).

Daily Monitoring:

From the second post-operative day until the tenth day, both groups were assessed daily:

- **Bowel Assessment:** Tracking symptoms and stool type using CAS and BSFS.
- **Fluid Monitoring:** Using the Intake and Output Chart to evaluate hydration status (15 minutes per patient).

Phase 3: Intervention

The Murdoch Bowel Protocol was applied to the study group, starting on the second post-operative day and lasting ten days. Interventions were tailored based on stool type (BSFS) and post-operative day:

1. **Days 2–3:**
   - **Constipation (Types 1–2):** High-fiber diet (22–34 g/day) **(Tan et al., 2023)**, fluid intake (≥3.7 L for males, ≥2.7 L for females) **(Yurtdaş et al., 2020)**, mild exercise as walking in corridor and activity of daily living (ADL) , oral lactulose administration if constipation persist, and medication adjustment.
   - **Ideal Stool (Types 3–4):** Regular diet, fluids, exercise, and oral lactulose as needed.
   - **Diarrhea (Types 5–7):** Reduced fiber, hydration to replace fluid loss, and limited exercise.
2. **Days 4–5:**
   - **Constipation:** Continue with previous interventions plus enema and oral lactulose if needed.
   - **Ideal Stool:** Continue with previous interventions.
   - **Diarrhea:** Same as the previous interventions with lactulose cessation.
3. **Days 6–7:**
   - **Constipation:** Continue with previous interventions plus referral to an Internal physician.
   - **Ideal Stool:** Continue with previous interventions.
   - **Diarrhea:** Continue with previous interventions with dietician referral if required.
4. **Days 8–10:**
   - **Constipation:** Continue with previous interventions plus and referral consultation with specialists.
   - **Ideal Stool:** Regular monitoring and oral lactulose cessation.
   - **Diarrhea:** Referral to Internal physician.

Each session lasted between 30–45 minutes per patient.

Phase 4: Evaluation

The outcomes of improve bowel habits were noticed over the intervention of ten days that confirm the protocol's effectiveness in managing constipation, maintaining ideal stool types, and addressing diarrhea.

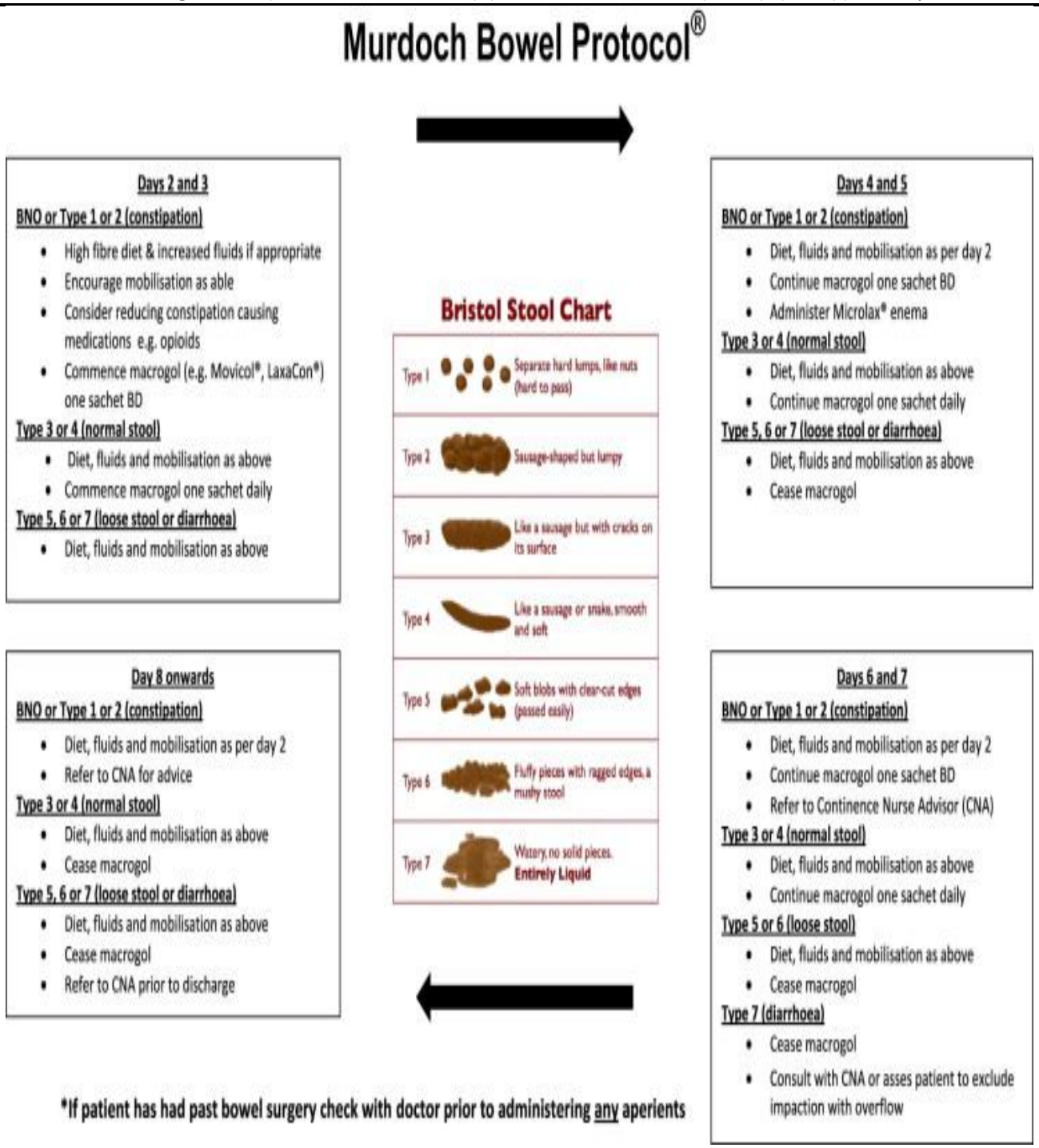

Figure 1, Murdoch Bowel Protocol Adopted from **(Bedawy et al., 2023; Ross-Adjie, 2012).**

III-Administrative Design:

Official permission was obtained from the Director of the Cardiothoracic Care Unit at Minia University Hospital, which 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.

IV. Statistical Design:

Statistical methods for data analysis: Descriptive statistics were used to summarize, tabulate, and display the data, including frequency distribution, percentages, means, and standard deviations to characterize the range of the data. SPSS (21) software was used for the statistical

analyses. Statistics were reported using mean and standard deviation. Frequency and percentages were used to represent qualitative information. The level of significance is represented by a probability (P-value). The significance level was set at a p-value of less than 0.05. The smaller the P-value obtained, the more significant the result is (*). Less than 0.001 was considered highly significant (**).

To assess confounding risk factors, The Pearson correlation test calculated correlation coefficients. Crude and multiple linear regression analyses were used to evaluate the effect of the study protocol on constipation prevention. The change in the beta coefficient of the primary predictor was monitored to ensure it did not exceed 20%, indicating independence of the outcome. Multicollinearity was tested using the variance inflation factor, showing no multicollinearity in the regression models. Residuals were independently and identically normally distributed.

Results:

Table (1): Frequency Distribution of Both Study and Control Groups Regarding Their Demographic Data (n=٩٠):

Demographic Data	Study (n=٤٥)		Control (n=٤٥)		Test of sig.	P-value
	No.	%	No.	%		
Gender						
Female	27	60	29	64.4	0.189	0.664
Male	18	40	16	35.6		
Age (Years)						
- 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
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		
Occupation						
Working	16	35.6	8	17.8	6.24	0.054
Not Working	13	28.8	24	53.3		
Housewife	16	35.6	13	28.9		
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		

* Statistically Significant Difference (P ≤ 0.05)

Table (1) Shows that the mean age of study and control groups was 47.6 ± 11.7 and 46.5 ± 11.8 years, respectively. Regarding gender, 60% of the study group were female, compared to 64.4% of the control group. Also, it was found that 64.4% of the study group compared to 62.2% of the control group were married. Regarding educational levels, it indicated that 55.6% of the study group compared to 44.4% of the control group were illiterate. Additionally, 28.8% of the study group compared to 53.3% were not working.

Table (2): Frequency Distribution of Both Study and Control Groups Regarding Their Medical Data (n=٩٠)

Medical Data	Study (n=٤٥)		Control (n=٤٥)		X^2	P-value
	No.	%	No.	%		
Present Diagnosis						
- CABG	16	35.6	20	44.4	0.741	0.519
- Valve Replacement	29	64.4	25	55.6		
Stay Period						
- <10 days	8	17.8	10	22.2	0.278	0.793
- ≥ 10 days	37	82.2	35	77.8		

Medical Data	Study (n=٤٥)		Control (n=٤٥)		X^2	P-value
	No.	%	No.	%		
Mean ± SD	11.6 ± 1.47		12.00 ± 2.14		0.802	0.424
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		
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		
Diet: Fiber Intake						
- Yes	18	40	15	33.3	0.431	0.512
- No	27	60	30	66.7		

* Statistically significant difference (P ≤ 0.05) CABG=Coronary artery bypass graft DM=Diabetes mellites

Table (2) Shows that 82.2% and 77.8% of the study and control groups, respectively, stayed in the hospital for ten days or more. As regards present diagnosis, 64.4% of the study group compared to 55.6% of the control group had valve replacement, while 35.6% and 44.4% of the study and control groups, respectively, did. 53.3% and 44.4% of study and control groups, respectively, had CABG. While 60% of the study group compared to 66.7% of the control group had fiber intake.

The participants in both groups often didn't take analgesics and laxatives together.

Table (3): Frequency Distribution of Both Study and Control Groups Regarding Total Score of Constipation Assessment Scale Pre and Post Implementation of Murdoch Bowel Protocol (n=٩٠)

Constipation Assessment	Day 1		Day 5		Day 10	
	Study (n=٤٥)	Control (n=٤٥)	Study (n=٤٥)	Control (n=٤٥)	Study (n=٤٥)	Control (n=٤٥)
	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)
No Constipation	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)
X^2 (p-value)	3.48 (0.323)		38.6 (0.001**)		54.6 (0.001**)	

* Statistically Significant Difference (P ≤ 0.05) ** Highly Statistically Significant Difference (P ≤ 0.01)

Table (3) Reveals that 100% of the study group had no constipation post-implementation of the Murdoch Bowel Protocol compared to 24.4% of the control group who received routine care on the tenth day, and there were statistically significant differences.

Table (4): Frequency Distribution of Both Study and Control Group Regarding Bristol Stool Form Scale Pre and Post Implementation of Murdoch Bowel Protocol (n=٩٠)

Bristol Stool Form Scale	Day 1		Day 5		Day 10		X^2 (p-value)
	Study (n=٤٥)	Control (n=٤٥)	Study (n=٤٥)	Control (n=٤٥)	Study (n=٤٥)	Control (n=٤٥)	
	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	
Constipation	17 (37.8)	14 (31.1)	3 (6.7)	21 (46.7)	0 (0)	22 (48.9)	**35.3 (0.001**)**
Ideal Stool	27 (69)	30 (66.7)	42 (93.3)	23 (51.1)	45 (100)	23 (51.1)	

Bristol Stool Form Scale	Day 1		Day 5		Day 10		X^2 (p-value)
	Study (n=٤٥)	Control (n=٤٥)	Study (n=٤٥)	Control (n=٤٥)	Study (n=٤٥)	Control (n=٤٥)	
	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	
Diarrhea	1 (2.2)	1 (2.2)	0 (0)	1 (2.2)	0 (0)	0 (0)	
X^2 (p-value)	0.448 (0.799)		20.9 (0.001**)		29.1 (0/001**)		

* Statistically Significant Difference (P ≤ 0.05) ** Highly Statistically Significant Difference (P ≤ 0.01)

Table (4) Shows that the study group hadn't had constipation post-implementation of the Murdoch Bowel Protocol compared to 48.9% of the control group who received routine hospital care, which suffered from constipation, on the tenth day. It was noticed that 100% of the study group compared to 51.1% of the control group had ideal stool with statistically significant differences.

Table (5): Mean Score of Both Study and Control Group Regarding Intake Amount, Output Amount, and Balance Pre and Post Implementation of Murdoch Bowel Protocol (n=٩٠)

Intake and Output Amount	Day 1		Day 5		Day 10		
	Study (n=45)	Control (n=45)	Study (n=45)	Control (n=45)	Study (n=45)	Control (n=45)	
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
Intake Amount	2580 ± 565.1	2576.6 ± 576.4	3180 ± 478.1	2638.8 ± 624.9	3437.7 ± 448.8	2600 ± 769.8	13.1 (0.001**)
Output Amount	2358.8 ± 509.4	2384.4 ± 547.0	2908.8 ± 481.3	2414.4 ± 627.0	3211.1 ± 424.3	2346.6 ±710.0	11.5 (0.001**)
t (P-Value)	3.36 (0.001**)		1.79 (0.079)		0.787 (0.433)		

* Statistically Significant Difference (P ≤ 0.05) ** Highly Statistically Significant Difference (P≤0.01)

Table (5) Reveals that the mean fluid intake of the study group 3437.7 ± 448.8 by day 10, while the control group decreased to 2600 ± 769.8. Significant differences were found between the groups in fluid intake and output, as indicated by t-test and ANOVA results.

Table (6a): Correlation between Fiber Intake and Presence of Constipation among Study and Control Groups

Constipation	Fiber Intake							
	Day 1				Day 10			
	Study (n=٤٥)		Control (n=٤٥)		Study (n=٤٥)		Control (n=٤٥)	
	R	*P*	*R*	*P*	*R*	*P*	*R*	*p*
	0.020	(0.896)	-0.186	0.221	-0.311	0.038*	-0.049	0.748

Table (6b): Correlation between Fluid Intake and Presence of Constipation among Study and Control Groups

Constipation	Fluid Intake							
	Day 1				Day 10			
	Study (n=٤٥)		Control (n=٤٥)		Study (n=٤٥)		Control (n=٤٥)	
	R	*P*	*R*	*P*	*R*	*P*	*R*	*p*
	0.202	(0.183)	-0.065	0.873	-0.305	0.042*	-0.225	0.183

Table (6a&b) Shows that there were positive correlations between the constipation occurrence and both fiber & fluid intake among the study group.

Discussion

Constipation can significantly overshadow surgical outcomes following open-heart surgery, exerting additional physiological and psychological stress on patients. Its impact extends beyond discomfort, potentially triggering severe hemodynamic changes due to the straining involved in defecation and the Valsalva maneuver. These physiological responses lead to transient hypertension and fluctuations in cardiac output, heart rate, and peripheral vascular resistance, all of which negatively affect cardiac function **(Rahmani et al., 2020; Mishima, 2024).** Given these implications, strategies to prevent or mitigate constipation, such as the Murdoch Bowel Protocol, which is a structured regimen that combines lifestyle modifications and laxative use when

necessary, are essential in this population **(Abd-Elraheem et al., 2020).**

Regarding the demographic and medical data of the studied groups, the mean age of participants in the study and control groups was similar, they were in the middle age group at 40 years of age, respectively. This similarity in age indicates one of the risk factors for open heart surgery, which is increasing age. Age is mainly combined with hypertension and atherosclerosis, which are significant risk factors for coronary artery bypass graft (CABG) in Egypt. This observation aligns with the findings by **(Aluru et al., 2022)** who reported an increase in the incidence of valvular heart diseases with increase age globally. (Coffey et al., 2021) and **(DesJardin et al., 2022)** also noted a growing prevalence of valvular heart disease (VHD) due to improved survival rates and an aging population. Additionally, **(Nicolini et al., 2014)** highlighted that age-related changes in the heart and blood vessels necessitate cardiothoracic surgery in older patients.

Gender distribution revealed a predominance of female participants, aligning with findings by **Sinha et al. (2023),** who reported higher rates of cardiac procedures among women. This could be attributed to differences in anatomical, hormonal, and physiological factors. **Beale et al. (2018)** observed that the cause of increase diagnosis in women, that the women have smaller left ventricular (LV) dimensions, stiffer ventricles, and distinct cardiac outputs compared to men. However, conflicting data exist: **Elfagieh (2023)** and **Yang et al. (2021)** reported a higher prevalence of cardiac surgeries among men. This variability may reflect regional and demographic differences or disparities in healthcare access and utilization patterns.

Regarding educational levels showed that nearly half of the study participants were illiterate, indicating a generally low educational status. This result is consistent with **Conlin and Schumann (2002)**, who found that individuals with lower socioeconomic status and limited formal education are more likely to present with advanced diseases, particularly cardiac conditions. This trend is largely attributed to a lack of awareness regarding risk factors and adherence to medical advice for managing cardiac diseases. However, **Christensen et al. (2020)** observed no significant correlation between educational level and the risk of cardiac events or mortality within one year after hospital discharge, suggesting that the influence of education on health outcomes may differ in various contexts. From the researchers' perspective, the historical rural culture in Egypt often discouraged individuals from pursuing or completing formal education, which has contributed to limited awareness of cardiac risk factors and unhealthy lifestyle choices.

Regarding diagnosis, the study showed that valve replacement was the most common procedure in Open Heart Surgeries while CABG was less frequent. From the researcher's point of view, it would be due to tonsillitis caused by streptococcus bacterial infection if not treated or if antibiotic treatment is incomplete increased risk of Rheumatic fever that affects heart valves.

These findings align with **iData Research (2024),** which identified valve replacements as one of the most frequently performed procedures in cardiac surgery, with projections indicating a significant rise to over 290,000 procedures annually in the U.S. by 2029. Similarly, **Aluru et al. (2022)** emphasized the growing incidence of valvular heart diseases, affecting approximately 41 million individuals globally, particularly in developing nations where rheumatic heart disease remains prevalent. This trend is further corroborated by studies from **Santangelo et al. (2023)** and **DesJardin et al. (2022).** Nonetheless, **iData Research (2024)** also highlighted that CABG remains the most common cardiac surgery, underscoring variability in procedural prevalence.

A low-fiber diet was major among participants, a concerning trend given the essential role of dietary fiber in preventing constipation. **Milosavljevic et al. (2022)** recommended a daily fiber intake of 20–30 g to optimize intestinal health, while **Ghanbari et al. (2023)** emphasized patient education to improve dietary habits. The findings of this study align with those by **Bedawy et al. (2023)** and **Abd El Kader & Youssef (2022),** who reported similar dietary inadequacies among their patient cohorts.

Fluid intake analysis showed notable improvements in the study group post-intervention. Adequate hydration is critical for bowel motility, as highlighted by **Yurtdaş et al. (2020)** and **Gbadago et al. (2023),** who recommended daily water intake ranging from 2.7–3.7 liters. Increased fluid intake in the study group likely contributed to improved constipation scores, reinforcing the importance of hydration in bowel management. From the researchers' perspective, both fluid and fiber intake are essential components for preventing and managing constipation, forming a cornerstone of a

healthy diet. Lack of fiber in diet and lack of fluids intake are a result of lack of awareness of their importance and the quality of healthy diet

The Bristol Stool Form Scale (BSFS) further corroborated these findings, showing a progressive improvement in stool consistency among the study group. By day 10, all participants achieved ideal stool types (Types 3 and 4), a significant improvement compared to the control group. This underscores the protocol's effectiveness in addressing both subjective symptoms and objective stool characteristics. **Hong et al. (2024)** and **Yamada et al. (2021)** highlighted the utility of the BSFS in monitoring treatment efficacy and optimizing bowel care interventions. From the researchers' perspective, achieving good results requires effective monitoring, and the BSFS offers accurate details about stool types, making it a valuable tool for following the implementation of a bowel care protocol.

Implementation of the Murdoch Bowel Protocol yielded significant improvements in bowel function. The Constipation Assessment Scale (CAS) revealed a marked reduction in constipation scores among the study group, with all participants achieving constipation-free status by day 10. This contrasts starkly with the control group, where constipation persisted in most patients. Similar results were reported by **Shanholtz et al. (2024),** who advocated for the widespread adoption of the protocol in clinical settings. From the researcher's perspective, patients who undergo open-heart surgery are at a higher risk of developing various complications after the procedure. Given the seriousness of the surgery, it is essential to prioritize the patient's health, ensure the success of the surgery, and guarantee a smooth recovery. Since the most challenging phase, the surgery itself, has already been completed, it is critical to follow standard protocols, including the Murdoch bowel protocol, to prevent constipation as one of complications.

The current study's findings align with several prior investigations supporting the efficacy of the Murdoch Bowel Protocol in diverse clinical settings. **Bedawy et al. (2023)** demonstrated significant constipation relief among orthopedic patients, while **McPeake et al. (2011)** reported a reduction in constipation incidence in intensive care units following protocol implementation. However, **Knowles et al. (2014)** reported no significant impact of similar interventions, emphasizing the need for tailored protocols based on patient population and clinical context.

The findings underscore the importance of a multifaceted approach to bowel care, integrating dietary modifications, hydration, and pharmacological support as needed. The Murdoch Bowel Protocol's success in improving bowel function and reducing constipation-related complications suggests its applicability in routine care for open-heart surgery patients. Assessment tools such as the CAS and BSFS should be incorporated into clinical practice to monitor intervention efficacy and guide patient management.

Conclusion

The Murdoch Bowel Protocol significantly reduced constipation symptoms and improved stool consistency among study group undergoing open-heart surgery. Applying the Murdoch Bowel Protocol enhanced recovery, reduced hospital stays, and improved the overall outcomes of the study group.

Recommendations

1. **Protocol Implementation**: Adopt the Murdoch Bowel Protocol as a standard practice for open-heart surgery patients.
2. **Regular Assessment**: Incorporate tools like the CAS and BSFS into routine patient monitoring to track bowel health and adjust care plans accordingly.
3. **Patient Education**: Increase awareness about the importance of adequate fiber intake, hydration, and physical activity to prevent constipation.
4. **Further Research**: Conduct longitudinal studies to evaluate the long-term benefits of the protocol and explore its application in other surgical populations.

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