



ORIGINAL ARTICLE

## Sodium phosphate a better choice for bowel preparation before colonoscopy as compared to polyethyleneglycol (PEG).

Hussain Tariq<sup>1</sup>, Akfish Zaheer<sup>2</sup>, Asad Mahmood Khan<sup>3</sup>, Hira Naz<sup>4</sup>, Nada Azam<sup>5</sup>, Umair Waheed<sup>6</sup>

**Article Citation:** Tariq H, Zaheer A, Khan AM, Naz H, Azam N, Waheed U, Ahmed S. Sodium phosphate a better choice for bowel preparation before colonoscopy as compared to polyethyleneglycol (PEG). Professional Med J 2022; 29(7):948-953.  
<https://doi.org/10.29309/TPMJ/2022.29.07.6926>

**ABSTRACT... Objective:** To compare the frequency of good to excellent quality of bowel preparation before colonoscopy in PEG versus sodium phosphate. **Study Design:** Randomized Controlled Trial. **Setting:** Department of Gastroenterology, Doctors Hospital and Medical Center, Lahore Pakistan. **Period:** March 2019 to December 2019. **Material & Methods:** 180 patients was selected by non-probability consecutive sampling and randomly divided in to two groups: group A (4L of polyethylene glycol (PEG) in a split dose fashion, i.e. 2L a day before colonoscopy and 2 L given 4-6 hours before colonoscopy) group B (2 doses of 20ml sodium phosphate 12hours apart before colonoscopy) using random number table. The attending gastroenterologist scored the different segment of colon cleansing by using the Boston Bowel Preparation Scale (BBPS). Data collected is analyzed by Statistical Package of Social Sciences (SPSS). **Results:** Among 90 patients who used sodium phosphate as bowel cleansing agent, 75 (83.3%) patient showed good to excellent result as compared with 90 patients who used PEG revealed the following result 71 (78.9%). p value was 0.44 revealing that there is no significant difference among both bowel preparation agents. **Conclusion:** Sodium phosphate can be used as an alternative agent in most of settings where PEG cannot be used either due to patient preference or due to its side effects.

**Key words:** Boston Bowel Preparation Scale (BBPS Polyethylene Glycol (PEG), Colonoscopy, Sodium Phosphate (NaP).

### INTRODUCTION

The American Gastroenterologist's Guide recommends that everyone over the age of 50 undergo a colonoscopy to detect colorectal cancer.<sup>1</sup>

Colonoscopy is a diagnostic and therapeutic procedure in which the endoscopy of the large intestine and the distal small intestine is performed by using a fiber optical endoscope. Small adenomas and precancerous lesions can be diagnosed by colonoscopy only if the colon is cleaned sufficiently before the colonoscopy.<sup>2</sup> A systematic review and meta-analysis confirmed that the well-prepared rate of hospitalized patients undergoing colonoscopy was low (67%).<sup>3</sup> Large-scale evaluations have shown the rate of incomplete colonoscopy, which is defined as the

inability to effectively achieve cecal intubation and mucosal visualization. These rates are between 10% and 20%, which are much higher than the recommendations of the United States Colorectal Cancer Multi-Social Working Group The goal.<sup>4</sup>

The ideal drug for bowel preparation before colonoscopy will clean the colon without causing changes in colonic mucosa histology, electrolyte imbalance, and patient discomfort, but until now, no drug has been considered an ideal colon preparation drug.<sup>5</sup> Commonly used medications for bowel preparation include 2-3 clear liquid diets per day and various administration combinations, such as tap water enemas, bisacodyl tablets or rectal suppositories, senna compounds, magnesium citrate, and metoclopramide.<sup>5</sup>

1. MBBS, FCPS (Gastroenterology), Senior Registrar Gastroenterology, General Hospital Ghulam Muhammadabad, Faisalabad, Pakistan.  
2. MBBS, M.Phil (Pharmacology), Assistant Professor Pharmacology, Independent Medical College, Faisalabad Pakistan.  
3. MBBS, M.Phil (Pharmacology), Associate Professor Pharmacology, Sahiwal Medical College, Sahiwal Pakistan.  
4. MBBS, MCPS Family Physician Family Medicine, Fatima Memorial Hospital, Lahore Pakistan.  
5. MBBS, M.Phil (Pharmacology), Assistant Professor Pharmacology, Central Park Medical College, Lahore Pakistan.  
6. MBBS, MD (Gastroenterology) Senior Registrar Gastroenterology, Govt General Hospital Ghulam Muhammad Abad, Faisalabad.

**Correspondence Address:**  
Dr. Hussain Tariq  
Department of Gastroenterology  
General Hospital Ghulam Muhammadabad,  
Faisalabad, Pakistan.  
hussainchattha7@gmail.com

**Article received on:** 08/12/2021  
**Accepted for publication:** 12/02/2022

Polyethylene glycol (PEG) is used as a laxative for bowel preparation. The agent is an isotonic and non-absorbable solution, it has been shown to be more effective as a colon cleanser with less gastrointestinal complaints and better tolerated by patients every time an oral antegrade colon lavage is performed, than the 2 and 3 day regimens.<sup>6</sup>

Sodium phosphate (NaP) solution, a buffered saline laxative, is popular as an alternative to colon preparation agent because of its smaller volume. Sodium phosphate is a hypertonic solution that increases the water content of the colon by attracting extracellular fluid through the intestinal wall and keeping the fluid in the lumen of intestine. NaP tablets are designed to improve taste and reduce the volume required for bowel preparation.<sup>7</sup>

The rationale for this study is to use the Boston Bowel Preparation Scale (BBPS) to compare the effects of PEG and sodium phosphate on colon cleansing. Despite poor patient compliance due to its side effects, polyethylene glycol remains the first choice for colonoscopy preparation for most of our patients. Sodium phosphate may be a better alternative because of its small dosage and fewer side effects. Therefore, this study plans to use the Boston Bowel Preparation Standard to compare two colonoscopy preparations, namely the PEG regimen and sodium phosphate.

## **MATERIAL & METHODS**

This Randomized Controlled Trial was conducted at Department of Gastroenterology, Doctors Hospital and Medical center, Lahore Pakistan from March 2019 to December 2019.

The Sample of 180 patients was collected by Non-probability consecutive sampling technique. The study was approved by ethical committee of hospital.

### **Inclusion Criteria**

Individuals between 20-70 years of age (both male and female) undergoing colonoscopy for per rectal bleeding, weight loss, anemia, screening for colorectal carcinoma and loose stools were

included in the study.

### **Exclusion Criteria**

Patients such as pregnant females, patient with myocardial infarction, massive ascites and acute infection were excluded.

### **Data Collection Procedure**

Sample was randomly divided in to two groups (group A, group B) using computer generated random number table.

Sample of 180 patients (90 in each group) fulfilling the inclusion criteria were selected from the inpatient and Out patient Department of Gastroenterology. Purpose of this study explained to each patient and informed consent was obtained. Demographic information including name, age, gender and indication for undergoing colonoscopy was obtained. All patients were randomly allocated to receive one of the two preparation regimens. All patients were divided in two groups,

### **Group A**

Individuals in group A received 4L of polyethylene glycol (PEG) in a split dose fashion, i.e. 2L a day before colonoscopy and 2 L given 4-6 hours before colonoscopy.<sup>8</sup>

### **Group B**

Individuals in group B received 2 doses of 20ml sodium phosphate 12 hours apart before colonoscopy.

For both preparation no solid food allowed after start of preparation. Patient were kept nil by mouth after midnight.

All colonoscopies were performed by gastroenterologist and after completion of procedure, the attending gastroenterologist scored different segment of colon cleansing by using the Boston Bowel Preparation Scale (BBPS). A total score (0-9) was calculated for each patient quality of agent was recorded. Gastroenterologist performing the procedure was unaware of how the patient was prepared. Good to excellent quality of preparation was recorded

as per operational definition.

### Data Analysis

The data collected was analyzed by Statistical Package of Social Sciences (SPSS statistics 22) to obtain the required information.

Data were stratified for age, gender and reason for colonoscopy. Frequency and percentages were calculated for gender and reason of colonoscopy. Numerical data such as age were presented as descriptive statistics such as mean  $\pm$  S.D. Chi-square test was applied to compare both groups. A p value of  $\leq 0.05$  was considered as statistically significant.

### RESULTS

Quality of colon cleansing with  $\geq 6$  score according to Boston Bowel Preparation Scale regarded as good to excellent. Our data revealed that 80.7% sample population had good to excellent bowel preparation and 18.9% had inadequate bowel preparation. (Figure-1)

Results shows that among 90 patients who used sodium phosphate as bowel cleansing agent, 75 (83.3%) patient showed good to excellent result as compared with 90 patients who used PEG revealed the following result 71 (78.9%). p value

was 0.44 revealing that there is no significant difference among both bowel preparation agents. Stratification of data regarding efficiency of both agent and male to female ration is displayed in Table-II.

Age range in this study was 20 to 70 years with mean age of  $45.67 \pm 14.00$ . Majority of patients 77 (50.46%) were between 40 to 60 year of age as shown in Table-I. Out of 180 patients, there were 106 (58.6%) males and 74 (40.9%) females underwent bowel preparation before colonoscopy. Male to female ratio was 1.43. Stratification of data regarding efficiency of both agents in relation to gender and age distribution is displayed in Table-II and III.

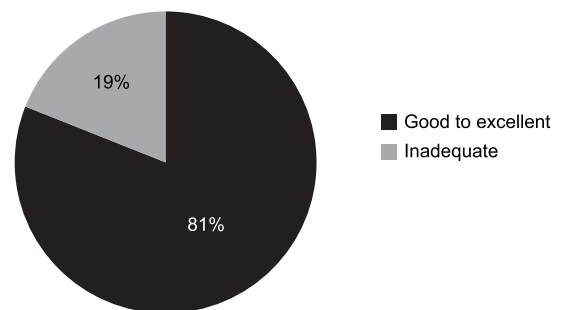


Figure-1. Graph showing the overall quality of bowel cleansing using either regimen.

Gender	PEG		Sodium Phosphate		
	Good to Excellent	Poor		Good to Excellent	Poor
	N (%)	%	N	%	%
Male	52 (75%)	25%	54	88.8%	11.1%
Female	38 (84%)	15.7%	36	75%	25%

Table-I. Stratification of both groups (PEG and sodium phosphate) with respect to gender  
Male to female ratio = 1.43, Male excellent to good = 92.2%, Female excellent to good = 79%

Age (years)	PEG		Sodium Phosphate	
	Good to Excellent %	Poor %	Good to Excellent %	Poor %
20-30	84.6	14.4	89.4%	10.5%
31-40	91.6	8.3%	100%	0%
41-50	75%	25%	80%	20%
51-60	72%	28%	75%	25%
61-70	60%	40%	64%	36%

Table-II. Stratification of both groups (PEG and sodium phosphate) with respect to age.

## DISCUSSION

Colonoscopy is currently the standard method for imaging the entire colonic mucosa. The high diagnostic performance of colonoscopy, especially for early tumor lesions, depends on good bowel cleansing. Several large studies have shown that the rate of adenoma detection in patients undergoing colonoscopy is as high as 25%.<sup>9</sup>

In Pakistan, the PEG regimen is used in most colonoscopies and is considered superior to other drugs, but an alternative drug is needed with the same efficacy, better patient tolerance, and cost-effectiveness.<sup>10</sup> Therefore, the current research plan compares these two drugs (PEG and sodium phosphate) with respect to the quality of colon cleansing using the Boston Bowel Preparation Scale. In this study, we used divided doses of 4L of PEG and two doses of 20ml sodium phosphate. Several studies conducted in different populations showed that these two programs are more effective than traditional programs.<sup>9,11,12,13</sup>

The results of our study concluded that the effects of the two preparations on colon cleansing were not significantly different, with a p value of 0.44. Sodium phosphate was also found to appear to be a better cleanser in 83% of patients compared to 78% for PEG. The same results were seen in previous studies.<sup>14</sup> In a randomized controlled trial of 586 patients, during colonoscope insertion, we found that 92.8% of patients in the PEG group had good or excellent bowel cleansing, which was significantly less than 96.6% of patients in the OSP group.<sup>15</sup>

In this study, we observed that the largest number of colonoscopies was performed at the age of 40-60, and most of them were male. It can be concluded from previous studies that men have the highest detection rate of adenoma compared with women of the same age group.<sup>16</sup>

Regarding demographics, one study showed that male gender is associated with insufficient preparation, especially in the age group older than 70 years, compared with patients younger than 50.<sup>17</sup>, but the results observed in the present study are not the same, effective colon cleansing

significantly affected by gender differences, observed in the results of the two formulations. In the current study, women are associated with poor bowel preparation. Stratification of the data shows that sodium phosphate shows better results in male patients compared to PEG.

The age distribution showed that patients who underwent a colonoscopy between the ages of 60-70 had poorer results in colon cleansing with two drugs (PEG and sodium phosphate). It can be concluded that advanced age leads to poor intestinal cleansing. In a retrospective study of 300 patients in the United States, univariate analysis showed that an average age of 66 years or older indicates insufficient preparation for colonoscopy.<sup>18</sup>

In the current study, 18.8% of patients had insufficient bowel cleansing due to the need for oral advice on preparation. Provide simple and easy-to-understand written instructions to the patient in the patient's native language. Due to lack of facilities or small sample size, this study has many limitations. Alternative bowel preparations need to be evaluated and tested to reduce the risk of missed adenomas and precancerous lesions.

## CONCLUSION

Sodium phosphate can be used as an alternative agent in most of setting where PEG cannot be used either due to patient preference or due to its side effects.

Sodium phosphate can be used in patients in whom inadequate bowel cleansing is reported on previous colonoscopy.

## LIMITATIONS

The limitation of the investigation procedure is the small sample size and the lack of adequate facilities to conduct the investigation.






There are some limitations attributable to the patient's behavior, such as non-compliance with the treatment plan and poor medical history in terms of symptoms and comorbidities

**Copyright© 12 Feb, 2022.**

## REFERENCES

1. Hassan C, East J, Radaelli F, Spada C, Benamouzig R, Bisschops R, Bretthauer M, Dekker E, Dinis-Ribeiro M, Ferlitsch M, Fuccio L. **Bowel preparation for colonoscopy: European Society of Gastrointestinal Endoscopy (ESGE) guideline-update 2019.** *Endoscopy.* 2019 Aug; 51(08):775-94.
2. Sharma P, Burke CA, Johnson DA, Cash BD. **The importance of colonoscopy bowel preparation for the detection of colorectal lesions and colorectal cancer prevention.** *Endoscopy international open.* 2020 May; 8(05):E673-83.
3. Gkolfakis P, Tziatzios G, Papanikolaou IS, Triantafyllou K. **Strategies to improve inpatients' quality of bowel preparation for colonoscopy: A systematic review and meta-analysis.** *Gastroenterology research and practice.* 2019 May 2; 2019.
4. Kastenberg D, Bertiger G, Brogadir S. **Bowel preparation quality scales for colonoscopy.** *World journal of gastroenterology.* 2018 Jul 14; 24(26):2833.
5. Rutherford CC, Calderwood AH. **Update on bowel preparation for colonoscopy.** *Current treatment options in gastroenterology.* 2018 Mar; 16(1):165-81.
6. Khorasanynejad R, Norouzi A, Roshandel G, Besharat S. **Bowel preparation for a better colonoscopy using polyethylene glycol or C-lax: A double blind randomized clinical trial.** *Middle East journal of digestive diseases.* 2017 Oct; 9(4):212.
7. Khorasanynejad R, Norouzi A, Roshandel G, Besharat S. **Bowel preparation for a better colonoscopy using polyethylene glycol or C-lax: A double blind randomized clinical trial.** *Middle East journal of digestive diseases.* 2017 Oct; 9(4):212.
8. Cheng YL, Huang KW, Liao WC, Luo JC, Lan KH, Su CW, Wang YJ, Hou MC. **Same-day versus split-dose bowel preparation before colonoscopy.** *Journal of clinical gastroenterology.* 2018 May 1; 52(5):392-400.
9. Adler A, Wegscheider K, Lieberman D, et al. **Factors determining the quality of screening colonoscopy: A prospective study on adenoma detection rates, from 12,134 examinations (Berlin colonoscopy project 3, BECOP-3).** *Gut* 2013; 62:236-241.
10. Asghar A, Alam L, Farooq A, Hayat A, Saeed F, Ahmed J. **Comparative analysis of colon preparation using Poly Ethylene Glycol (Peg) with lactulose for colonoscopy.** *PAFMJ.* 2020 Oct 30; 70(5):1261-65.
11. Marmo R, Rotondano G, Riccio G et al. **Effective bowel cleansing before colonoscopy: A randomized study of split-dosage versus non-split dosage regimens of high-volume versus low-volume polyethylene glycol solutions.** *Gastrointest Endosc* 2010; 72: 313-320.
12. Di Palma, J.A., Rodriguez, R., McGowan, J. et al. **A randomized clinical study evaluating the safety and efficacy of a new, reduced-volume, oral sulfate colon-cleansing preparation for colonoscopy.** *Am J Gastroenterol.* 2009; 104: 2275–2284.
13. Enestvedt, B.K., Tofani, C., Laine, L.A. et al. **4-Liter split-dose polyethylene glycol is superior to other bowel preparations, based on systematic review and meta-analysis.** *Clin Gastroenterol Hepatol.* 2012; 10: 1225–1231.
14. Dang JT, Moolla M, Dang TT, Shaw A, Tian C, Karmali S, Sultanian R. **Sodium phosphate is superior to polyethylene glycol in constipated patients undergoing colonoscopy: A systematic review and meta-analysis.** *Surgical endoscopy.* 2021 Feb; 35(2):900-9.
15. Yang D, Tao K, Chen G, Zhang L, He Q, Xu H. **Randomized controlled trial of polyethylene glycol versus oral sodium phosphate for bowel preparation in unsedated colonoscopy.** *Gastroenterology Research and Practice.* 2020 Aug 24; 2020.
16. Chen C, Stock C, Hoffmeister M, Brenner H. **Optimal age for screening colonoscopy: A modeling study.** *Gastrointestinal endoscopy.* 2019 May 1; 89(5):1017-25.
17. Baker FA, Mari A, Nafrin S, Suki M, Ovadia B, Gal O, Kopelamn Y. **Predictors and colonoscopy outcomes of inadequate bowel cleansing: A 10-year experience in 28,725 patients.** *Annals gastroenterol.* 2019 Sep; 32(5):457.
18. Nguyen DL, Wieland M. **Risk factors predictive of poor quality preparation during average risk colonoscopy screening: The importance of health literacy.** *J Gastrointestin Liver Dis.* 2010 Dec; 19(4):369-72.

**AUTHORSHIP AND CONTRIBUTION DECLARATION**

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Hussain Tariq	Study design, Data collection.	
2	Akfish Zaheer	Manuscript writing, Data analysis.	
3	Asad Mahmood Khan	Drafting manuscript, Critical analysis.	
4	Hira Naz	Acquisition of data, drafting manuscript.	
5	Nada Azam	Conception of study design, Critical review.	
6	Umair Waheed	Helped in data collection.	