DOI: https://doi.org/10.53350/pjmhs202317893

ORIGINAL ARTICLE

A Randomized Controlled Trial Comparing Polyethylene Glycol with Sodium Phosphate for Gut Preparation in children undergoing Proctoscopy

UMAIR KHALIQ SIDDIQI[1], MUHAMMAD SHARIF[2], HAFIZA MARIAM RAFIQ[3], HAMZA MALIK[4], MUHAMMAD KASHIF BASHIR[5], HAFIZ MUHAMMAD ADNAN[6]

[1,3]PGR, Pediatric Surgery, Mayo Hospital, Lahore
[2]HOD Pediatric Surgery, Mayo Hospital, Lahore
[4]University of Child Health Sciences, Lahore
[5]Associate Professor Pediatric Surgery, Mayo Hospital, Lahore
[6]Assistant Professor Pediatric Surgery, Mayo Hospital, Lahore
Correspondence to Prof. Muhammad Sharif, Email: doctorsharif@gmail.com, Cell: 0321-4822717

ABSTRACT

Background: The outcome of diagnostic and therapeutic procedures such as proctoscopy, colonoscopy, and endoscopy relies on thorough bowel preparation, ensuring a complete view of the colonic mucosa.
Aim: To compare polyethylene glycol with sodium phosphate for gut preparation in children undergoing proctoscopy.
Methods: We conducted a study on pediatric patients aged 3 to 14 years who underwent elective proctoscopy. The study took place in the pediatric surgical ward of Mayo Hospital, Lahore, following approval from the hospital's Ethical Committee. We educated the parents or guardians of patients preoperatively about the use of bowl preparatory agents, their effectiveness, outcomes, side effects, complications, and informed consent. We divided the children into two groups to determine the method of bowl preparation. Patients in Group 'A' underwent bowl preparation using polyethylene glycol.
Results: There were 60 patients, with 30 in each group. Patients in Group 'A' were given bowl preparation with polyethylene glycol. Before the proctoscopy, the patients underwent a 1-day PEG 3350 bowel preparation regimen. While group B had bowel preparation with sodium phosphate enema, the patients' mean ages were 4.46 years. In group A, there were 16 males and 14 females, while in group B, there were 19 males and 11 females. In group A, 11 patients demonstrated excellent compliance, 12 showed partial compliance, and 7 showed poor compliance with polyethylene glycol. While in group B, 22 patients showed excellent compliance, and 8 patients showed good compliance.
Practical Implication: The study suggests that both polyethylene glycol (PEG) and sodium phosphate enema are suitable for pediatric patients undergoing proctoscopy. However, compliance rates vary between the two methods. Patients in group A showed varying levels of compliance, while those in group B showed higher compliance. Therefore, healthcare providers should consider sodium phosphate enema for improved patient adherence and procedural outcomes. This highlights the importance of assessing compliance rates for informed decision-making.
Conclusion: In our experience, sodium phosphate enema was superior to oral polyethylene glycol in terms of compliance and adequacy of gut preparation. There were also fewer side effects with the sodium phosphate enema.
Keywords: Polyethylene glycol, proctoscopy, gut preparation

INTRODUCTION

In children, there are various indications for diagnostic proctoscopy, e.g., rectal bleeding, painful defecation, identification of rectal polyps, assessment of rectal prolapse, and monitoring of the gut mucosa in inflammatory bowel disease (IBD). Good and clean bowel exposure is important in diagnosing and monitoring pathological lesions, as well as guiding further management[1]. The outcome of diagnostic and therapeutic procedures such as proctoscopy, colonoscopy, and endoscopy relies on thorough bowel preparation, ensuring a complete view of the colonic mucosa. There are various methods for bowel preparation in children and adults. Commonly used bowel preparation agents include bisacodyl, sodium picosulfate, sodium phosphate, polyethylene glycol solution, etc. These agents either work by encompassing bowel lavage (agents promoting bowel cleanout) or cathartics (agents promoting defecation)[2]. You can select the bowel preparation agents based on the patient's age, size, and clinical status. The choice of preparation method, whether lavage or cathartics, requires careful consideration to achieve both safety and efficacy. An individualized approach helps minimize discomfort and ensures the child's cooperation during the procedure.

Despite multiple efforts to establish a universal standard regimen for pediatric bowel preparation, there is still no widely accepted protocol, and diverse approaches have been attempted with varying degrees of effectiveness. The quality of bowel preparation directly influences the clarity of the colonic view, which is crucial for successful proctoscopy outcomes. Establishing standardized protocols for pediatric bowel preparation remains a challenge, emphasizing the need for ongoing research to refine regimens and improve the overall experience for young patients undergoing proctoscopy[3].

Children recognize polyethylene glycol (PEG) solution for its safety and efficacy in providing thorough gut cleansing. Children commonly use it as a bowel preparation agent before various gastrointestinal procedures. It is generally well-tolerated by children in oral solution due to its tasteless nature and lack of significant side effects. Rectal enema with polyethylene glycol is also very effective for large-bowel cleansing. This makes it a preferred choice for ensuring compliance and minimizing discomfort during gut preparation.

Children undergoing various gastrointestinal procedures recognize sodium phosphate, a hyperosmolar solution, for its efficacy in gut preparation. Its hyperosmotic nature allows for efficient evacuation of the bowels, ensuring clear visualization of the colonic mucosa during diagnostic examinations like proctoscopy and colonoscopy. The low volume of the enema makes it particularly suitable for pediatric use, minimizing potential discomfort for children during the preparation process. S However, careful attention to dosage and potential risks, such as electrolyte imbalances, is essential to ensure its safe and successful application in pediatric gut preparation[4].

The main objective of the study is to compare the polyethylene glycol with sodium phosphate for gut preparation in children undergoing proctoscopy.

Received on 07-05-2023
Accepted on 17-07-2023

MATERIAL AND METHODS

Pediatric patients between the ages of 3 and 14 who underwent elective proctoscopy participated in the study. We conducted the study in the Pediatric Surgical Ward of Mayo Hospital, Lahore, following the hospital's Ethical Committee's approval. We educated the parents or guardians of patients preoperatively about the use of bowl preparatory agents, their effectiveness, outcomes, side effects, complications, and informed consent. We divided the children into two groups to determine the method of bowl preparation. Patients in Group 'A' were given bowl preparation with polyethylene glycol. A 1-day PEG 3350 bowel preparation regimen before proctoscopy involved mixing PEG 3350 (238 g if purchased over the counter or 255 g if obtained by prescription) in 20ml/kg of a commercially available sports drink. Children were instructed to consume the mixture within a 2-hour period in the afternoon before the pro the day before the proctoscopy, we allowed all children a regular meal for breakfast and lunch, and only clear liquids up to 3 hours prior to their scheduled procedures. Group 'B'→ Patients underwent bowl preparation with sodium phosphate enema. Sodium phosphate on the morning of the procedure, children over 12 years old received a 118ml sodium phosphate enema, while those under 12 years old received 59ml and they were instructed to remain on their left side. The ward admitted the patients and conducted baseline investigations. We gave patients and parents a questionnaire, conducted interviews, and evaluated their acceptance and compliance with their assigned bowel preparation method, diet, and willingness to retake it in the future if necessary. Diverse effects could potentially cause adverse effects such as bloating, abdominal pain, nausea or vomiting and anal or rectal discomfort during enemas. Additionally, the preparation could lead to diarrhea, fecal incontinence, sleep disturbance, or the need we graded the adequacy of the preparation as excellent, good, average, and poor. The surgeon remained blind to the preparation method and the questionnaire results.

Data Analysis: Data was entered and analyzed using statistical software, SPSS version 26. Quantitative variables like age were presented as mean±S.D. Qualitative variables like gender were presented as frequency and percentage. A comparison of both study groups, low pressure and standard pressure, was done by applying chi-square, and a p value of ≤ 0.05 will be considered significant.

RESULTS

A study was conducted involving patients of pediatric age between 3 and 14 years of age who underwent elective proctoscopy. The study was conducted in the pediatric surgical ward of Mayo Hospital, Lahore, after receiving approval from the hospital's Ethical Committee. There were 60 patients, with 30 patients in each group. Group 'A'→ patients underwent bowel preparation with polyethylene glycol. 1-day PEG 3350 bowel preparation regimen before proctoscopy. While group B had bowel preparation with sodium phosphate enema, the mean age of the patients was 4.46 years. In group A, there were 16 males and 14 females, while in group B, there were 19 males and 11 females.

In group A, 11 patients demonstrated excellent compliance, 12 showed partial compliance and 7 showed poor compliance with polyethylene glycol. While in group B, 22 patients showed excellent compliance, and 8 patients showed good compliance (P value 003) (Table 1).

Table 1: Compliance with polyethylene glycol

Agent	Compliance			Total
	Complete	Partial	Poor	
Polyethylene	11	12	7	30
Sodium phosphate	22	8	0	30
Total	33	20	7	60

P value 0.003

In terms of efficacy of gut preparation all only 14 patients showed excellent preparation with polyethylene glycol. While 20 patients had excellent preparation, 10 patients had good preparation with sodium phosphate enema (p value 0.003).

Table 2: Adequacy of gut preparation

Agent	Adequacy				Total
	Excellent	Good	Average	Poor	
Polyethylene	14	8	6	2	30
Sodium phosphate	20	10	0	0	30
Total	34	18	6	2	60

P value 0.026

In terms of adverse effects 10 patients had nausea and abdominal pain with polyethylene, while 3 patients had rectal discomfort with sodium phosphate enema.

Table 3: Complications after the procedure (p value 0.500)

Agent	Adverse effects			Total
	Yes	No	11.00	
Polyethylene	10	18	2	30
Sodium phosphate	3	27	0	30
Total	13	45	2	60

DISCUSSION

There are limited studies available in the literature that compare the efficacy oral polyethylene and sodium phosphate enemas for gut preparation in pediatric populations. The usage of polyethylene glycol in the pediatric population as an osmotic laxative is widespread, and its effectiveness is well established. Polyethylene, commonly known as PEG, finds extensive utility in pediatric medicine for gastrointestinal (GI) cleansing. Its mechanism of action includes fluid secretion into the colon and facilitation of bowel movements[5].

Similarly, sodium phosphate also functions by inducing fluid secretion into the bowel, facilitating evacuation. It is widely utilized for colon cleansing prior to diagnostic procedures such as colonoscopies; its efficacy is notable[6].

In our study, we included 30 patients in each group and compared the results in terms of the adequacy of bowel evacuation, compliance with the cleansing agent, and any side effects due to the agents used. In terms of compliance with the agent, 22 patients showed excellent compliance with sodium phosphate as compared to 11 patients in the polyethylene group[7]. Patients showed poor compliance with oral PEG. Interestingly, no patient showed poor compliance with sodium phosphate enema in group B. The really poor tolerability is because it requires the consumption of a large amount of fluid and may necessitate the use of a nasogastric (NG) tube. In our study, we did not evaluate the use of NG tubes in our patients. As the patient gets older, the amount needed to clean the bowels increases greatly (up to 4 liters), which may decrease the tolerability in older patients. Sodium phosphate enemas required a much smaller quantity of fluid[8].

Aydemir Y et al compared the efficacy and tolerability of polyethylene glycol (PEG) and sodium phosphate (NP) for pediatric patients. The records of pediatric patients who underwent colonoscopy and used either PEG or NP for bowel cleansing between January 2016 and December 2019 were analyzed[9],[10]. The quality of bowel preparation was assessed according to the Ottawa scale, including cleanliness and fluid quantity. There were a total of 145 patients (65 boys, 44.8%), with a mean age of 12.3±4.2 years. PEG was used in 93 patients (64.1%), while NP was used in 52 patients (35.9%). In contrast to the results of our study, the patients who used PEG had significantly better tolerance without any complaints when compared to the patients who used NP (49/93 patients (52.7%) vs. 14/52 patients (26.9%), respectively, p = 0.003)[11]. In their study, the sodium phosphate group had significantly more frequent moderate-severe side effects

when compared to the PEG group (15/52 patients (28.8%) vs. 15/93 patients (16.1%), respectively[12]. The Ottawa bowel preparation quality score in the right colon and total Ottawa scale rating were significantly better in the NP group when compared to the PEG group (p = 0.009 and 0.034, respectively).

In our study, 14 patients showed excellent, 8 good, 6 adequate, and 2 patients showed poor gut cleansing with PEG. In contrast, 20 patients showed excellent bowel cleansing, and 10 patients had good bowel cleansing with sodium phosphate enema. Adequate bowel cleansing with good patient tolerability is important for a high-quality and safe colonoscopy[13].

CONCLUSION

In our experience sodium sulphate enema is a better option for gut cleansing in children as compared to oral polyethylene in terms of tolerability, adequacy and side effects. However studies with larger population may be needed to validate the results.

Authorship and contribution declaration: Each author of this article fulfilled following Criteria of Authorship:

1. Conception and design of or acquisition of data or analysis and interpretation of data.
2. Drafting the manuscript or revising it critically for important intellectual content.
3. Final approval of the version for publication.

All authors agree to be responsible for all aspects of their research work.

Conflict of interest: None

Funding: None

REFERENCES

1. Pasquarella CS, Kaplan B, Mahajan L, Lamparyk K, Kay M. A single-center review of pediatric colonoscopy quality indicators. J Pediatr Gastroenterol Nutr. (2019) 68:648–54.
2. Brief J, Chawla A, Lerner D, Vitola B, Woroniecki R, Morganstern J. The impact of a smartphone app on the quality of pediatric colonoscopypreparations: randomized controlled trial. JMIR Pediatr Parent. (2020)3:e18174.
3. Tutar E, Bayrak NA, Volkan B, Ertem D. Bowel preparation for colonoscopyin children: 1 day PEG-3350 with bisacodyl versus 3 day sennosides. Dig Dis.(2019) 37:334–42
4. Szaflarska-Poplawska A, Tunowska D, Sobieska-Poszwa O, Gorecka A,Krogulska A. Corrigendum to “the effectiveness, tolerability, and safetyof different 1-day bowel preparation regimens for pediatric colonoscopy.”Gastroenterol Res Pract. (2020) 2020:9126957.
5. Vejzovic V, Wennick A, Idvall E, Agardh D, Bramhagen A-C. Polyethylene glycol- or sodium picosulphate-based laxatives before colonoscopy in children. J Pediatr Gastroenterol Nutr. (2016) 62:414–9.doi: 10.1097/MPG.0000000000000978
6. Cuffari C, Ciciora SL, Ando M, Boules M, Croffie JM. Pediatric bowel preparation: Sodium picosulfate, magnesium oxide, citric acid vs.polyethylene glycol, a randomized trial. World J Gastroenterol. (2020)26:6260–9. doi: 10.3748/wjg.v26.i40.6260
7. Elitsur R, Butcher L, Vicki L, Elitsur Y. Polyethylene glycol 3350 based coloncleaning protocol: 2 d vs 4 d head to head comparison. World J Gastrointest Endosc. (2013) 5:165–8.
8. Walia R, Steffen R, Feinberg L, Worley S, Mahajan L. Tolerability, safety,and efficacy of PEG 3350 as a 1-day bowel preparation in children. J Pediatr Gastroenterol Nutr. (2013) 56:225–8. doi: 10.1097/MPG.0b013e3182758c69
9. Aydemir Y, Barıs Z, Yurttas GN, Yavuz A, The Comparison of Efficacy and Tolerability of Two Bowel Preparation Agents in Children: Polyethylene Glycol vs Sodium Phosphate, Osmangazi Journal of Medicine, 2020;42(6):613-619
10. Gremse DA, Sacks AI, Raines S. Comparison of oral sodium phosphate to polyethylene glycol-based solution for bowel preparation for colonoscopy in children. Journal of Pediatric Gastroenterology and Nutrition. 1996 Dec;23(5):586-590. DOI:
11. Shieh TY, Chen MJ, Chang CW, Hung CY, Hu KC, Kuo YC, Shih SC, Wang HY. Effect of physician-delivered patient education on the quality of bowel preparation for screening colonoscopy. Gastroenterol Res Pract 2013;2013:570180.
12. Bechtold ML, Choudhary A. Bowel preparation prior to colonoscopy: a continual search for excellence. World J Gastroenterol 2013;19:155-157.
13. Rex DK, Petrini JL, Baron TH, Chak A, Cohen J, Deal SE, Hoffman B, Jacobson BC, Mergener K, Petersen BT, Safdi MA, Faigel DO, Pike IM; ASGE/ACG Taskforce on Quality in Endoscopy. Quality indicators for colonoscopy. Am J Gastroenterol 2006;101:873-885.

This article may be cited as: Siddiqi UK, Sharif M, Rafiq HM, Malik H, Bashir MK, Adnan HM: A Randomized Controlled Trial Comparing Polyethylene Glycol with Sodium Phosphate for Gut Preparation in children undergoing Proctoscopy. Pak J Med Health Sci, 2023, 18(8):93-95.