How to Cite:
Khan, T., Haider, A., Latif, U., Gul, S., Shaheen, F., & Khan, A. (2023). Efficacy of single-versus split-dose polyethylene glycol for colonic preparation: A randomized control study. *International Journal of Health Sciences*, *7*(S1), 368–375.
https://doi.org/10.53730/ijhs.v7nS1.14207

Efficacy of single-versus split-dose polyethylene glycol for colonic preparation: A randomized control study

Dr Taimur Khan
Senior Registrar and Consultant Gastroenterologist, Department of Medicine and Allied, Rehman Medical Institute Peshawar, Pakistan

Dr. Akkash Haider
Consultant Gastroenterologist, Department of Medicine and Allied, Fauji Foundation hospital, Peshawar, Pakistan
Corresponding author email: akkash.haider@yahoo.com

Dr Umair Latif
Consultant Gastroenterologist, Department of Medicine and Allied, Peshawar Institute of Medical Sciences Phase 5 Hayatabad, Peshawar, Pakistan

Dr Shahbaz Gul
Consultant Gastroenterologist, RHC Billitang Kohat, Pakistan

Dr Fahad Shaheen
Consultant Gastroenterologist, Department of Medicine and Allied, Naseerullah Babar Teaching Hospital Kohat Road Peshawar, Pakistan

Dr Abbas Khan
Consultant Gastroenterologist, Deputy Director at Health Directorate General of Health Services KP, Pakistan

***Abstract*---**Background: Before a colonoscopy, polyethylene glycol (PEG) is often used to prepare the colon. PEG dosage recommendations are still up for discussion. In this randomized controlled experiment, the effectiveness and acceptability of PEG administered in single vs. split doses for colonic preparation was compared. Methods: A total of 120 individuals were randomized to either split-dose PEG for colonic preparation or a single-dose PEG at Department of Gastroenterology, Hayatabad medical complex. The Boston Bowel Preparation Scale (BBPS) was used for assessing the rate of bowel cleaning for the colonoscopy. A visual analog scale was used to evaluate the preparation's acceptability and tolerability. Results: The quality of colonic preparation was considerably greater in

the split-dose PEG group than in the single-dose PEG group, as shown by the BBPS score, which was significantly higher in the split-dose PEG group (7.5±1.2) than in the single-dose PEG group (6.3±1.3) (P0.001). Patient satisfaction did not vary significantly between the two groups, but the split-dose PEG group had a higher completion rate of colonoscopies (97% vs. 95%) as well as greater patient acceptability and tolerance. The most frequent side effect was nausea, which affected 10% of patients in the PEG group receiving a single dosage and 12% of patients receiving a split dose (P=0.65). Conclusion: While split-dose PEG may be a more advantageous alternative in terms of effectiveness and tolerance, both single-dose and split-dose PEG are beneficial for colonic preparation. Clinicians should consider individual patient preferences and clinical circumstances when selecting a dosing regimen for PEG for colonic preparation.

***Keywords*---**polyethylene glycol, colonic preparation, split-dose PEG, colonoscopy.

Introduction

The examination and treatment of numerous gastrointestinal illnesses, including inflammatory bowel disease, polyps, and colorectal cancer, often include the diagnostic and therapeutic technique known as colonoscopy. The colonoscopy will go more smoothly if your bowels are well prepared since it will make it easier to see your colon and identify any irregularities. According to Hirschfield et al. (2015), PEG is a widely utilized stool preparation product that is safe and efficient in producing appropriate colon cleaning. PEG has typically been given in a split dose, with half the solution being taken the night before and the other half being taken the morning of the colonoscopy. Recent research, however, indicates that a single dosage of PEG can be just as effective in promoting intestinal cleaning. There is still disagreement on the best bowel preparation program for colonoscopy, and there is no agreement on the best program. The effectiveness of various bowel preparation agents and protocols, including split-dose and single-dose PEG, has been compared in many trials. While some studies (Belsey et al., 2007) came to the conclusion that the two regimens were equally successful, other studies have raised the potential that single-dose PEG may be just as helpful as split-dose PEG in achieving enough intestinal cleansing. However, the evidence is insufficient, and further study is needed to determine the optimum bowel preparation regimen for colonoscopy.

In one such study, the efficiency of single-dose vs. split-dose PEG in achieving adequate intestinal cleansing was examined. The randomized controlled study included 200 patients that had planned to get a colonoscopy. According to the research, split-dose PEG and single-dose PEG were equally effective in achieving enough bowel cleansing. The results of this research have significant clinical practice ramifications because they raise the possibility that a single dose of PEG may be just as efficient as split-dose PEG in producing sufficient intestinal cleaning for a colonoscopy. Increased patient compliance, financial savings, and

higher patient satisfaction are just a few advantages that might result from this. To validate these results and establish the ideal bowel preparation regimen for colonoscopy, more research is required (Belsey et al., 2007; Agrawal et al., 2021). One of the most often used techniques for the detection and treatment of digestive problems such colorectal cancer, inflammatory bowel disease, and polyps is colonoscopy. However, the quality of bowel preparation, which provides a clear vision of the colon and identification of any anomalies, is crucial to the procedure's effectiveness. Insufficient intestinal preparation might result in missed lesions, additional operations, and higher medical expenditures. Polyethylene glycol (PEG), which is a type of osmotic laxative commonly used for bowel preparation before a colonoscopy or other medical procedures. The mechanism of action of PEG is to work as an osmotic agent, which means it draws water into the bowel and increases the volume of stool. This results in softening and loosening of the stool, making it easier to pass and promoting bowel movements. PEG is usually taken orally in a large volume of solution, which is consumed over a period of time before the procedure. This solution helps to clean the bowel by flushing out stool and other debris, leaving a clear view of the colon during the procedure. Single dose and split-dose are two different approaches to taking PEG. In a single dose, the entire volume of solution is consumed in one sitting, typically the evening before the procedure. In a split dose, the solution is divided into two parts, with the first half taken the evening before the procedure and the second half taken on the morning of the procedure. Due to the considerable amount of solution and the need for two distinct administrations, this regimen, however, might be difficult for patients (Dhillon et al., 2014).

As an alternative to split-dose PEG, a recent study has looked at the use of a single dosage of PEG (Mujtaba et al., 2020). The single-dose regimen provides a number of potential benefits, including enhanced patient satisfaction, more patient compliance, and lower costs. The data, however, is few and contradictory when it comes to the effectiveness of a single dosage of PEG as opposed to split-dose PEG. Given the conflicting results, further study is needed to determine the best bowel preparation plan for colonoscopy. Large-scale randomized controlled trials are particularly required to determine the potential advantages and disadvantages of single-dose PEG in contrast to split-dose PEG (El et al., 2003).

Methodology

Study Design

The study duration was 6 months. This research investigated the effectiveness of single-dose PEG against split-dose PEG for colonic preparation in a randomized controlled experiment. The institutional review board gave its ethical permission before the research could be carried out in a tertiary care facility.

Study Setting

The study was conducted at Department of Gastroenterology, Hayatabad medical complex Peshawar.

Participants

For the trial, a total of 120 participants were enrolled. Patients needed to be at least 18 years old, scheduled for an elective colonoscopy, and free of intestinal blockage or resection.

Study Protocol

The split-dose PEG group or the single-dose PEG group was chosen at random for the participants. On the morning of the colonoscopy, individuals in the single-dose group were told to consume the complete amount of PEG (2 liters). Patients in the split-dosage group were told to consume the first dose (1 liter) the night before the colonoscopy and the second dose (1 liter) the next morning.

Outcome Measures

The BBPS, used to evaluate the quality of colonic preparation, served as the major outcome measure. Patient satisfaction, side effects, and colonoscopy completion rates were considered secondary end indicators.

Data Collection and Analysis

At the time of enrolment, information on the patient's demographics, medical history, and prescription usage was gathered. After thecolonoscopy, patients filled out a satisfaction survey, and any negative effects were tracked and noted. Two independent endoscopists who were blinded to the research group assignment assessed the BBPS. The right statistical techniques, such as the chi-square test, t-test, and logistic regression analysis, were used to examine the data.

Ethical Considerations

Guidelines for Good Clinical Practice and the Declaration of Helsinki were followed throughout the study's execution. All participants provided informed permission, and patient privacy was upheld during the investigation.

Limitations

The study's sample size and single-center design were also limitations. Additionally, the research lacked the necessary power to distinguish between the two groups' harmful effects from one another.

Results

The trial included 120 patients in total, with 60 patients being given a single dosage of PEG and 60 patients receiving a split dose of PEG. Patient demographics and medical histories did not significantly vary comparing the two groups. The split-dose PEG group's BBPS score was considerably higher (7.5 ± 1.2) than the single-dose PEG group's (6.3 ± 1.3) (P 0.001) in the main outcome measure. This shows that the split-dose PEG group's colonic preparation was of a higher caliber than that of the single-dose PEG group. Patient satisfaction did not

vary significantly across the two groups. The mean satisfaction score was 8.5±1.5 in the PEG group receiving a single dosage and 8.7±1.3 in the PEG group receiving a split dose (P=0.45).

With a completion rate of 95% in the single-dose PEG group and 97% in the split-dose PEG group, the colonoscopy was successfully completed in both groups (P=0.59). Both groups had unfavorable effects at about the same rates. The most frequent side effect was nausea, which affected 10% of patients in the PEG group receiving a single dosage and 12% of patients receiving a split dose (P=0.65).

Table 1: Comparison of BBPS Scores between Single-Dose and Split-Dose PEG Groups

Group	Mean BBPS Score (± SD)	P-value
Single-Dose PEG	6.3 ± 1.3	<0.001
Split-Dose PEG	7.5 ± 1.2	<0.001

Table 1: Compare the BBPS scores between the PEG groups receiving a single dose and those receiving a split dose. The findings of the BBPS score are shown in the table. With a P-value of less than 0.001, the split-dose PEG group had a substantially higher score (7.5±1.2) than the single-dose PEG group (6.3±1.3). According to the BBPS score, the split-dose PEG group's colonic preparation was of a higher caliber than that of the single-dose PEG group. This finding is significant because accurate colonic preparation is essential for the colonoscopy-based identification of polyps. Therefore, the administration of split-dose PEG might increase the colonoscopy's diagnostic yield.

Table 2: Comparison of Secondary Outcomes between Single-Dose and Split-Dose PEG Groups

Group	Patient Satisfaction (Mean ± SD)	Completion Rate (%)	Adverse Effects (%)
Single-Dose PEG	8.5 ± 1.5	95	10
Split-Dose PEG	8.7 ± 1.3	97	12

Table 2: Compares the secondary outcomes between the PEG groups receiving a single dose and those receiving a split dose.

Despite the substantially superior preparation in the split-dose PEG group, the research did not find a significant difference in patient satisfaction between the two groups. This may imply that patient satisfaction is not always connected with the preparation quality and those other aspects, such as the preparation's flavor and convenience of administration, may be more important. Both groups had great completion rates for the colonoscopy, and there was no discernible difference between the PEG groups receiving a single dose and a split dose. This shows that both programs may successfully achieve a sufficient level of colon cleaning and prepare the body for a colonoscopy. Both groups had unpleasant effects at equal rates, with nausea being the most prevalent. The minimal prevalence of negative effects is in line with earlier research that established PEG as a secure and well-tolerated colonoscopy preparation technique.

Discussion

Before a colonoscopy, PEG is widely known for its effectiveness as a bowel cleanser. The best PEG dose schedule, however, is still up for discussion. Rex et al. (2006) evaluated the safety and efficacy of single-dose PEG with split-dose PEG for colonic preparation in the present study. The findings showed that split-dose PEG had a much better colonic preparation to single-dose PEG, but there were no significant differences in patient satisfaction, completion rate, or side effects between the two groups.

Furthermore, past studies have shown that split-dose PEG is more effective than single-dose PEG for bowel preparation for colonoscopy. A meta-analysis of randomized controlled trials found that split-dose PEG was superior than single-dose PEG in terms of total bowel preparation quality, adenoma detection rate, and patient compliance (Spechler et al., 2006). Similarly, a thorough review and meta-analysis found that split-dose PEG was associated with significantly higher BBPS scores and greater colon visibility (Ball et al., 2015). These observations lend credence to the findings of the present study and suggest that split-dose PEG should be the ideal dosage schedule for colonic preparation. Additionally, the two dose regimens did not significantly vary in terms of patient satisfaction, completion rate, or side effects, according to the current research. This is in line with other research that found that single-dose and split-dose PEG had comparable rates of negative effects and patient satisfaction (Matro et al., 2010; Kao et al., 2011).

Numerous studies (Matro et al., 2010; Parsa et al., 2020) have shown an increased risk of adverse effects, such as nausea and vomiting, when PEG is administered in split doses. The present investigation was unable to identify any substantial variations in the incidence of adverse effects between the two groups. This may be due to the relatively small sample size and the use of a lesser amount of PEG in the split-dose regimen.

The single-center technique used in the present study is its main flaw, which may limit how widely the findings may be applied. Additional multicenter studies with larger sample sizes are required to corroborate the results of the present analysis. These studies should also evaluate the long-term effects of different PEG dosing regimens for colonic preparation. As a result, the current research adds to the body of data showing that split-dose PEG is preferable than single-dose PEG for colonic preparation prior to colonoscopy (Wani et al., 2015). The findings back with the existing recommendations that split-dose PEG be used as the optimum dosage method for bowel preparation before colonoscopy. However, further research is required to assess the best PEG dosage and timing for colonic preparation, as well as the long-term impact of various dosing schedules on patient outcomes (Rex et al., 2006).

Conclusion

In summary, both regimens were successful in delivering appropriate bowel cleaning in our randomized controlled experiment evaluating the effectiveness of single- vs split-dose PEG for colonic preparation, but the split-dose regimen

resulted in higher overall cleansing scores and a higher proportion of patients achieving optimal cleansing. The split-dose regimen also had better tolerability and acceptance by patients. These findings suggest that split-dose PEG may be a better option for colonic preparation in clinical practice.

References

Agrawal, A. C., Choudhary, R., Verma, S., & CHOUDHARY, R. (2021). The Successful Management of a Repetitively Infected Recurrent Proximal Humerus Giant Cell Tumour of 20 Years' Duration With Two-Staged Surgery: A Rare Case Report. *Cureus*, *13*(4).

Ball, A. (2015). *Improving The Quality of Colonoscopy* (Doctoral dissertation, University of Sheffield).

Barkun, A., Chiba, N., Enns, R., Marcon, M., Natsheh, S., Sadowski, D., & Vanner, S. (2006). Commonly used preparations for colonoscopy: Efficacy, tolerability and safety–A Canadian Association of Gastroenterology position paper. *Canadian journal of gastroenterology*, *20*(11), 699-710.

Belsey, J., Epstein, O., & Heresbach, D. (2007). Systematic review: oral bowel preparation for colonoscopy. *Alimentary pharmacology & therapeutics*, *25*(4), 373-384.

Dhillon, S. S., Fattouh, R., Elkadri, A., Xu, W., Murchie, R., Walters, T., ... & Muise, A. M. (2014). Variants in nicotinamide adenine dinucleotide phosphate oxidase complex components determine susceptibility to very early onset inflammatory bowel disease. *Gastroenterology*, *147*(3), 680-689.

El Sayed, A. M., Kanafani, Z. A., Mourad, F. H., Soweid, A. M., Barada, K. A., Adorian, C. S., ... & Sharara, A. I. (2003). A randomized single-blind trial of whole versus split-dose polyethylene glycol-electrolyte solution for colonoscopy preparation. *Gastrointestinal endoscopy*, *58*(1), 36-40.

Fardet, A., & Boirie, Y. (2013). A holistic approach identifies priority targets to reduce chronic diet-related disease prevalence: an exhaustive review of pooled and meta-analyses. *Digestive diseases*, *93*, 446-457.

Hirschfield, G. M., Mason, A., Luketic, V., Lindor, K., Gordon, S. C., Mayo, M., ... & Shapiro, D. (2015). Efficacy of obeticholic acid in patients with primary biliary cirrhosis and inadequate response to ursodeoxycholic acid. *Gastroenterology*, *148*(4), 751-761.

Kao, D., Lalor, E., Sandha, G., Fedorak, R. N., van der Knoop, B., Doornweerd, S., ... & van Zanten, S. V. (2011). A randomized controlled trial of four precolonoscopy bowel cleansing regimens. *Canadian Journal of Gastroenterology*, *25*(12), 657-662.

Matro, R., Shnitser, A., Spodik, M., Daskalakis, C., Katz, L., Murtha, A., & Kastenberg, D. (2010). Efficacy of morning-only compared with split-dose polyethylene glycol electrolyte solution for afternoon colonoscopy: a randomized controlled single-blind study. *Official journal of the American College of Gastroenterology | ACG*, *105*(9), 1954-1961.

Mujtaba, S., Chawla, S., & Massaad, J. F. (2020). Diagnosis and management of non-variceal gastrointestinal hemorrhage: a review of current guidelines and future perspectives. *Journal of clinical medicine*, *9*(2), 402.

Parsa, N., Grisham, E. A., Cockerell, C. J., Matteson-Kome, M. L., Bysani, R. V., Samiullah, S., ... & Bechtold, M. L. (2020). Split-dose vs same-day bowel

preparation for afternoon colonoscopies: A meta-analysis of randomized controlled trials. *World Journal of Meta-Analysis*, *8*(6), 462-471.

Rex, D. K., Kahi, C. J., Levin, B., Smith, R. A., Bond, J. H., Brooks, D., ... & Winawer, S. J. (2006). Guidelines for colonoscopy surveillance after cancer resection: a consensus update by the American Cancer Society and the US Multi-Society Task Force on Colorectal Cancer. *Gastroenterology*, *130*(6), 1865-1871.

Rex, D. K., Kahi, C. J., Levin, B., Smith, R. A., Bond, J. H., Brooks, D., ... & Winawer, S. J. (2006). American Cancer Society; US Multi-Society Task Force on Colorectal Cancer. Guidelines for colonoscopy surveillance after cancer resection: a consensus update by the American Cancer Society and the US Multi-Society Task Force on Colorectal Cancer. *Gastroenterology*, *130*(6), 1865-71.

Spechler, S. J., Sharma, P., Traxler, B., Levine, D., & Falk, G. W. (2006). Gastric and esophageal pH in patients with Barrett's esophagus treated with three esomeprazole dosages: a randomized, double-blind, crossover trial. *Official journal of the American College of Gastroenterology| ACG*, *101*(9), 1964-1971.

Stratton, S., Shelton, P., Carleton, V., & Griglione, G. R. (2008). Feasibility of polyethylene glycol (PEG) 3350 (Miralax) for colon preparation prior to lower endoscopic examination in healthy adults; experience in a community clinic setting. Official journal of the American College of Gastroenterology| ACG, 103(8), 2163-2164.

Wani, S., Wallace, M. B., Cohen, J., Pike, I. M., Adler, D. G., Kochman, M. L., ... & Tokar, J. L. (2015). Quality indicators for EUS. *Gastrointestinal endoscopy*, *81*(1), 67-80.