

Low-residue versus clear liquid diet before colonoscopy: a meta-analysis of randomized, controlled trials

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Background and Aims: Colonoscopy is extremely important for the identification and removal of precancerous polyps. Bowel preparation before colonoscopy is essential for adequate visualization. Traditionally, patients have been instructed to consume only clear liquids the day before a colonoscopy. However, recent studies have suggested using a low-residue diet, with varying results. We evaluated the outcomes of patients undergoing colonoscopy who consumed a clear liquid diet (CLD) versus low-residue diet (LRD) on the day before colonoscopy by a meta-analysis.

Methods: Scopus, PubMed/MEDLINE, Cochrane databases, and CINAHL were searched (February 2015). Studies involving adult patients undergoing colonoscopy examination and comparing LRD with CLD on the day before colonoscopy were included. The analysis was conducted by using the Mantel-Haenszel or DerSimonian and Laird models with the odds ratio (OR) to assess adequate bowel preparations, tolerability, willingness to repeat diet and preparation, and adverse effects.

Results: Nine studies (1686 patients) were included. Patients consuming an LRD compared with a CLD demonstrated significantly higher odds of tolerability (OR 1.92; 95% CI, 1.36-2.70; $P < .01$) and willingness to repeat preparation (OR 1.86; 95% CI, 1.34-2.59; $P < .01$) with no differences in adequate bowel preparations (OR 1.21; 95% CI, 0.64-2.28; $P = .58$) or adverse effects (OR 0.88; 95% CI, 0.58-1.35; $P = .57$).

Conclusion: An LRD before colonoscopy resulted in improved tolerability by patients and willingness to repeat preparation with no differences in preparation quality and adverse effects. (*Gastrointest Endosc* 2016;83:499-507.)

Colorectal cancer contributes significantly to mortality related to cancer in the United States.¹ In an effort to reduce the risk of death associated with colorectal cancer, early identification and subsequent removal of adenomatous polyps are crucial.² At this time,

Abbreviations: BBPS, Boston Bowel Preparation Scale; CI, confidence interval; CLD, clear liquid diet; LRD, low-residue diet; OR, odds ratio; RCT, randomized, controlled trial.

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colonoscopy is the best test for this goal.³ However, colonoscopy success depends on many factors, with a major factor being the quality of bowel preparation.^{4,5} Bowel preparations that are inadequate have been shown to decrease diagnostic yield, increase potential adverse events, and prolong procedure times.⁵ Failure to comply with the bowel preparation instructions has been shown to be a significant cause of inadequate bowel preparation.⁶⁻⁹ Ingestion of a large volume of fluid to purge the bowel reduces patient compliance, leading to suboptimal bowel preparation.^{7,8} Furthermore, patients are often instructed to adhere to the dietary restriction of only clear liquids on the day before a colonoscopy, which can further add to patient noncompliance.

BACKGROUND

A clear liquid diet (CLD) excludes all solids foods and only allows drinking of transparent liquids. With a CLD, the colon is less likely to have residual food contents. However, many patients find it difficult to comply

with both the diet and the order to ingest a large volume of preparation solution before their planned colonoscopy. Several studies have evaluated the use of a more liberalized low-residue diet (LRD) compared with the traditional CLD the day before multiple testing modalities, including CT colonoscopy,¹⁰⁻¹³ capsule endoscopy,¹⁴ and colonoscopy.¹⁵⁻²⁷ Studies on the use of an LRD before colonoscopy have shown variable results on the impact on preparation quality and patients' satisfaction. An LRD typically consists of low-fiber materials such as chicken noodle soups, vanilla shakes, energy bars, and applesauce.²⁸ The goal of this meta-analysis was to evaluate the effects of bowel-preparation protocols with an LRD compared with the standard CLD before colonoscopy.

METHODS

Literature search

A 3-point systematic and comprehensive literature search was performed on multiple databases. First, Scopus, Cochrane databases, MEDLINE/PubMed, and CINAHL were searched in February 2015. Search terms were "low-residue diet and colonoscopy," "fiber-free diet and colonoscopy," and "diet liberalization and colonoscopy." Details of search terminology are as follows: Low-residue [All Fields] AND ("diet" [MeSH Terms] OR "diet" [All Fields]) AND ("colonoscopy" [MeSH Terms] OR "colonoscopy" [All Fields]), fiber-free [All Fields] AND ("diet" [MeSH Terms] OR "diet" [All Fields]) AND ("colonoscopy" [MeSH Terms] OR "colonoscopy" [All Fields]), and ("diet" [MeSH Terms] OR "diet" [All Fields]) AND liberalization [All Fields] AND ("colonoscopy" [MeSH Terms] OR "colonoscopy" [All Fields]). Second, abstracts from Digestive Disease Week, United European Gastroenterology, and the American College of Gastroenterology meetings were searched from 2004 to 2014. Last, all of the references from the reviewed articles underwent a search for any other articles that may have been missed. Authors were contacted if the data needed clarification or were not complete. Two authors (E.T.N. and D.L.N.) independently reviewed all the titles and abstracts for inclusion or exclusion of studies. Any disagreements on study inclusion were settled by a third party (M.L.B.).

Data extraction

Studies on adult patients undergoing bowel preparation that compared LRD with CLD before a colonoscopy were included. Each study was required to have at least 1 low-residue meal the day before a colonoscopy and used the same bowel preparation for both diet groups. Two reviewers (E.T.N. and D.L.N.) extracted the data independently with any disagreements being settled by a third party (M.L.B.) or consensus decision.

Study quality assessment

Study quality was evaluated by 2 tools, the Cochrane's Collaboration Risk of Bias Tool²⁹ and the Jadad scale.³⁰ The Jadad scoring scale, ranging from 0 (low quality) to 5 (high quality), critiques each study on various potential mechanisms of bias. Low- or low-to-moderate-quality studies are those with a score of ≤ 2 , whereas high-quality studies are those with a score of ≥ 3 . Furthermore, each outcome was given a grade based on the quality of evidence. The grade is described as high, moderate, low, or very low based on the assessment of limitations within included studies, consistency of results, precision, effect magnitude, and publication and other forms of bias.^{31,32}

Statistical analysis

Adult patients ingesting an LRD were compared with those ingesting a CLD on the day before colonoscopy for adequate bowel preparations, tolerability, willingness to repeat preparation, and overall adverse effects by meta-analysis. Pooled estimate analyses were conducted for adequate bowel preparations, tolerability, willingness to repeat preparation, and overall adverse effects. Adequate bowel preparation was defined by the authors in each individual study but generally referred to as excellent and good preparation for the Aronchick scale, ≥ 6 for the Boston Bowel Preparation Scale (BBPS), or scores of A or B for the Harefield Cleansing Scale.³³⁻³⁵ Tolerance of the bowel preparation regimen was determined by the authors of each study, and categorical data were pooled and analyzed. Results were presented as odds ratios (OR) by using the 2 models, the Mantel-Haenszel (the fixed-effects model) in outcomes with no heterogeneity and the DerSimonian and Laird (the random-effects model) in outcomes with significant heterogeneity. The I^2 measure of inconsistency ($P < .10$ or $I^2 > 50\%$ was significant) was used to assess heterogeneity. If statistically significant heterogeneity was identified, the results underwent a separate sensitivity analysis. This analysis removed specific studies and re-examined outcome results for continued heterogeneity. RevMan 5.3 (Review Manager, Version 5.3, Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2012) was used for statistical analysis. Funnel plots were analyzed for presence of publication bias.

RESULTS

Study selection

The search of the literature initially identified 119 articles/abstracts (Fig. 1). Of these, 20 articles and abstracts were selected for review. Of these selected, 9 articles met the inclusion criteria for this meta-analysis. Details of study selection are shown in Appendix A (available online at www.giejournal.org).

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