

Symptomatic Response to Antibiotics in Patients with Small Intestine Bacterial Overgrowth: A Systematic Review and Meta-Analysis



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BACKGROUND

Small intestinal bacterial overgrowth (SIBO) is characterized by an increase in proteobacteria in the small intestine and is associated with gastrointestinal symptoms such as bloating and diarrhea. Although there is limited data, antibiotics are commonly used to treat this condition and previous meta-analyses have shown that antibiotics can successfully eradicate SIBO (normalize breath test). Currently, there have been no high-quality, multicenter trials evaluating the efficacy of antibiotics in improving symptoms. Here, we performed the first systematic review and meta-analysis to assess the efficacy of antibiotics to relieve symptoms in patients with SIBO.

AIM

A systemic review and a meta-analysis was conducted comparing the symptomatic response rate to antibiotics in IBS patients with or without SIBO

METHODS

A systematic review and meta-analysis was performed following the PRISMA protocol. MEDLINE, EMBASE, Web of Science, and Cochrane were searched from inception to March 2021. Only prospective cohort studies were included. Studies were included if SIBO was diagnosed based on breath test or small bowel aspirate. Only studies with dichotomous outcomes were included. The rate of no improvement was compared between antibiotics vs placebo or no antibiotics. A random effect model was used for meta-analysis. To assess study bias, the Cochrane Handbook for Risk Assessment was used. Specifically, each study was evaluated on its random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, and select reporting. Studies that were assessed to have 2 or more categories with high risk of bias were deemed poor quality.

RESULTS

Of 694 citations, 647 were excluded based on the title or abstract and 46 were evaluated in detail. After reviewing the manuscript, 6 studies met the inclusion criteria and were included in the meta-analysis (Table 1). Of the 196 patients included in the analysis, 101 received antibiotics and 95 received placebo or no antibiotics. The rate of non-response for each study is shown in Figure 1. Overall, the RR (95% CI) of no improvement was 0.63 (0.43-0.91) with antibiotics compared to no antibiotics or placebo (Figure 2). The NNT for antibiotics in relieving symptoms was 2.8. There was significant heterogeneity with $I^2 = 69.3\%$. There was no publication bias based on Egger's test ($t = -1.5936$, $df = 4$, $p = 0.1863$), although the small sample size limits its interpretation. Four studies were deemed to be of poor quality and 2 studies were deemed to be of fair quality.

Table 1. Study Characteristics

Study	Country	Sample size (% female)	Disease	Method to diagnose SIBO	Criteria for symptomatic improvement	Antibiotic used	Duration of therapy	Duration of follow-up
Biancone 2000	Italy	14 (50%)	Crohn's disease	Glucose breath test	Change in CDAI	Rifaximin 400 mg BID	7 days	7 days
Pimentel 2003	US	93 (62%)	Rome I IBS	Lactulose breath test	≥ 50% reduction in composite score of pain, diarrhea, and constipation	Neomycin 500 mg BID	10 days	7 days
D'inca 2007	Italy	22	Diverticular disease	Lactulose breath test	Global symptomatic improvement	Rifaximin 600 mg BID	14 days	End of treatment
Ghoshal 2016	India	34 (19%)	Rome III IBS	Duodenal aspirate 10 ³ CFU	No longer meeting Rome III Criteria for IBS	Norfloxacin 400 mg BID	10 days	30 days
Ghoshal 2018	India	13 (54%)	Rome III IBS-C or FC	Lactulose breath test (methane)	BSS ≥ 3	Rifaximin 400 mg BID	14 days	7 days
Furnari 2019	Italy	20 (48%)	Cystic Fibrosis	Glucose breath test	≥ 50% reduction in composite GI score	Rifaximin 10 mg/kg TID (up to 400 mg TID)	14 days	21 days

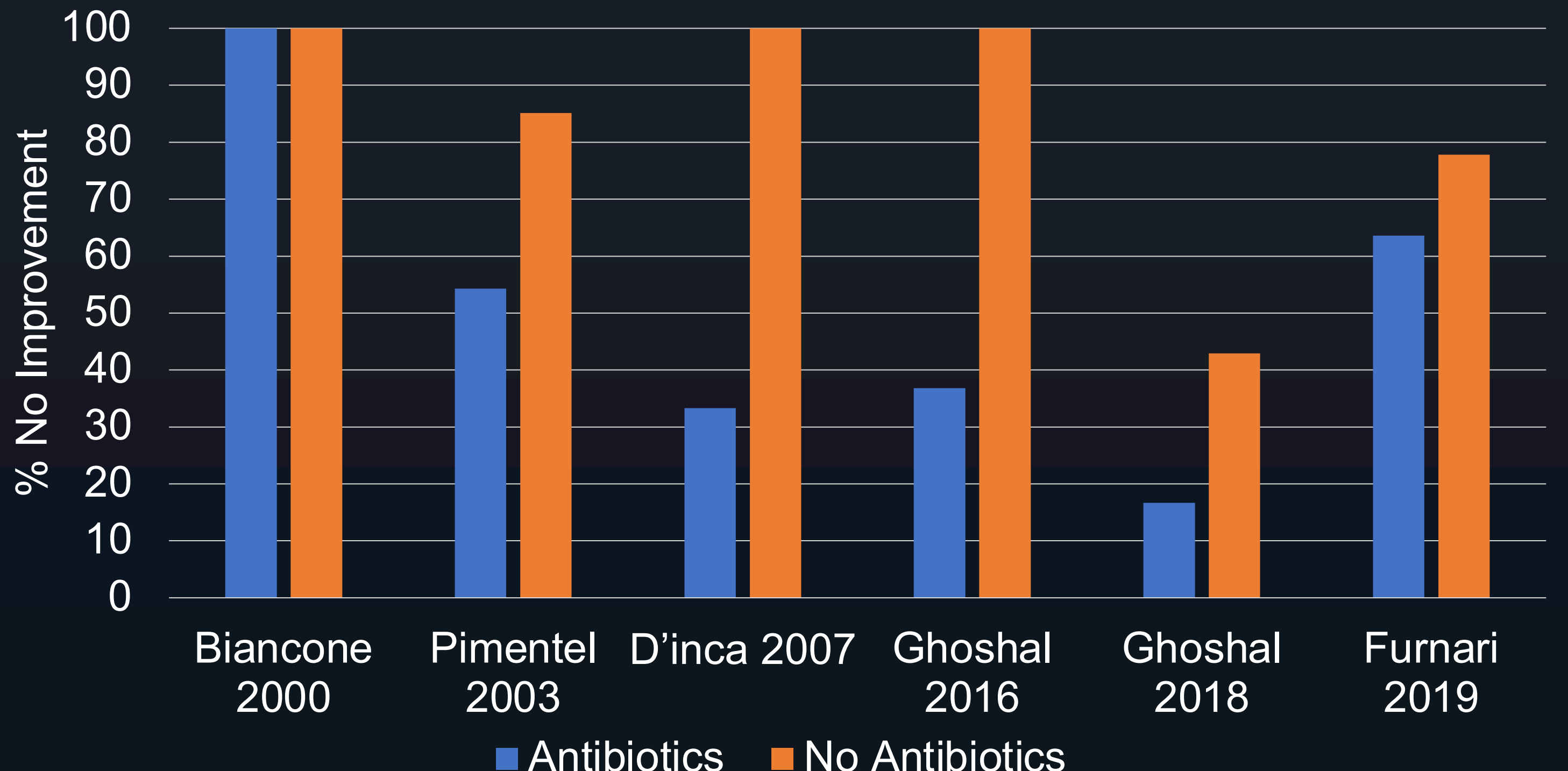


Figure 1. Bar graph of non-response rate of studies included in the meta-analysis. The pooled non-response rate was 50.5% vs 86.4% for those treated with antibiotics vs no antibiotics or placebo.

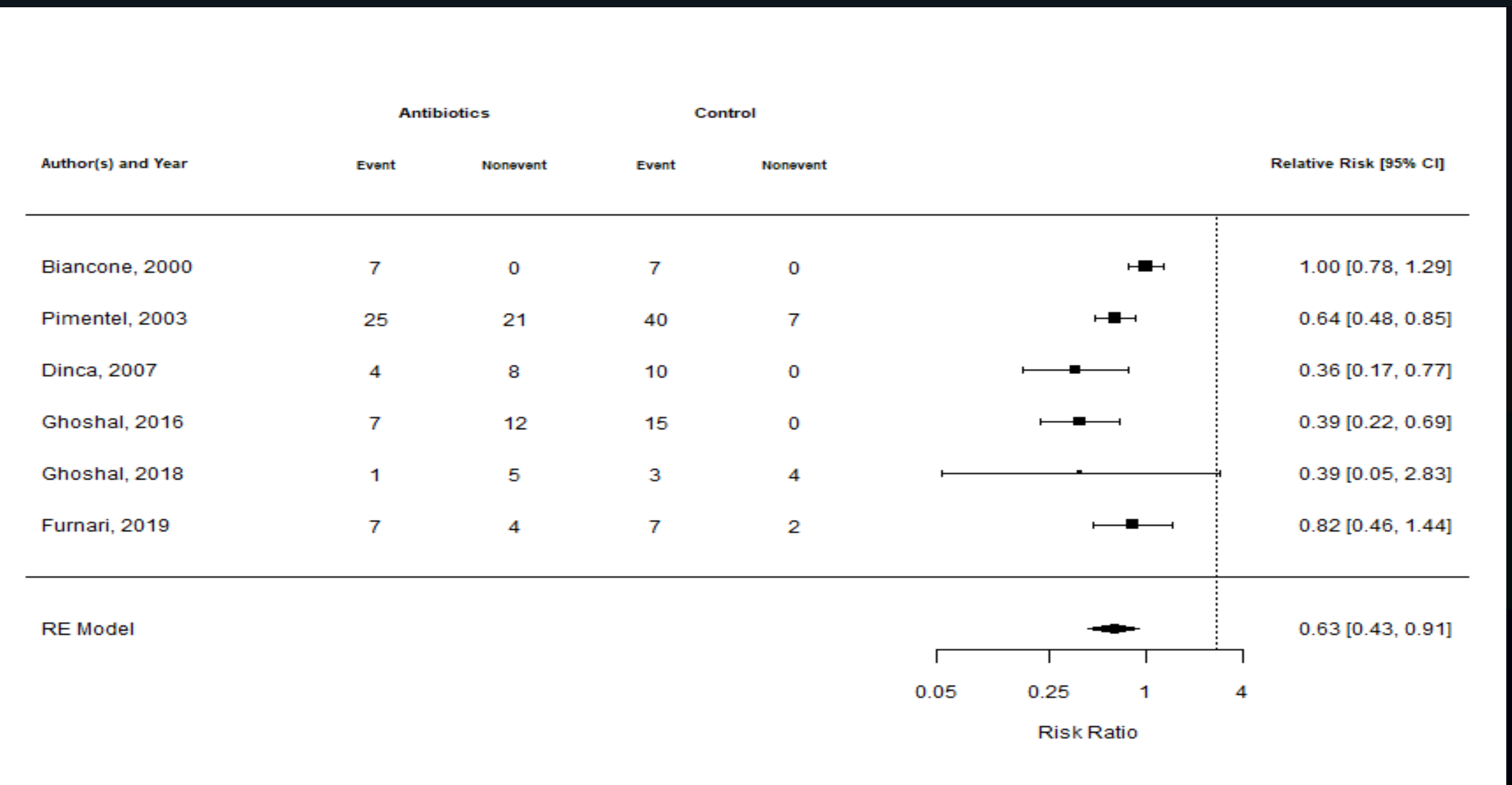


Figure 2. Forrest plot of studies comparing the non-response rate to antibiotics in patients with SIBO. The risk ratio favors the use of antibiotics.

CONCLUSIONS

- In this first systemic review and meta-analysis to compare the symptomatic response in patients with SIBO, antibiotics had a higher rate of symptomatic improvement compared to placebo or no antibiotics.
- The NNT was 2.8
- The data justifies a multi-center, double-blind, randomized controlled trial to confirm these results