

Effect of Vegan Diet During Greek-Orthodox Religious Fasting on Symptoms of Disorders of Gut-Brain Interaction

Daniel-Corneliu Leucuta¹, Dan L. Dumitrascu^{1,2}, Shrikant I. Bangdiwala^{3,4}, Olafur S. Palsson⁵, Ami D. Sperber⁶

1) Iuliu Hatieganu University
of Medicine and Pharmacy

Cluj-Napoca, Romania;

2) Romanian Academy of
Scientists;

3) Department of Health
Research Methods, Evidence
and Impact, McMaster
University, Hamilton, ON,
Canada;

4) Population Health Research
Institute, McMaster University,
Hamilton, ON, Canada;

5) Center for Functional GI &
Motility Disorders, University
of North Carolina, US;

6) Faculty of Health Sciences,
Ben-Gurion University of the
Negev, Beer-Sheva, Israel

ABSTRACT

Background & Aims: Religious fasting observed in diverse populations may influence the reporting of digestive symptoms. Greek-Orthodox (Byzantine style) religious fasting is prolonged and similar to a vegan diet. We aimed to evaluate the association between functional gastrointestinal symptoms and disorders of gut-brain interaction (DGBI) with this religious fasting.

Methods: We investigated Romanian participants in the Rome Foundation Global Epidemiology Study who observe Greek-Orthodox religious fasting, by adding specific questions on religious fasting to the study questionnaire. Data were analyzed in connection with the reported gastrointestinal symptoms.

Results: 2015 Romanians were included in the analyses. Overall, 716 (35.5%) of the respondents practiced some fasting, of which 446 (62.3%) fasted on Easter and Christmas, 90 (12.6%) observed all fasts, and 625 (87.3%) practiced weekly fasting. Of the latter, 167 (23.3%) fasted every week and 90 (12.6%) reported symptoms during fasting. There were no statistically significant associations between Greek-Orthodox fasting, to any degree, with upper or lower DGBI or gastrointestinal symptoms.

Conclusions: The results from this representative sample show that a substantial proportion of the Romanian population adheres to Greek-Orthodox fasting. However, in contrast to the *a priori* hypothesis, we did not have sufficient evidence that religious fasting is associated with the prevalence of DGBI, or with functional gastrointestinal symptoms.

Key words: disorders of gut-brain interaction – fasting – functional gastrointestinal disorders – irritable bowel syndrome – Romania – vegan diet.

Abbreviations: DGBI: disorders of gut-brain interaction; FODMAP: fermentable oligosaccharides, disaccharides, monosaccharides and polyols; IBS: irritable bowel syndrome; IBS-SSS: IBS symptom severity scale; PHQ-4: Personal Health Questionnaire-4; PHQ-12: Patient Health Questionnaire-12; PROMIS-10: Patient-Reported Outcomes Measurement Information System Global-10; QOL: quality of life; RFGES: The Rome Foundation Global Epidemiology Study.

INTRODUCTION

The disorders of gut-brain interaction (DGBI) [1], formerly known as functional gastrointestinal diseases, are a broad spectrum of gastrointestinal symptoms brought on by a complex interplay of contributing factors, including gut microbial dysbiosis, altered mucosal immune function, altered gut signaling (visceral hypersensitivity), and central

nervous system dysregulation of the modulation of gut signaling and motor function [2]. The Rome Foundation Global Epidemiology Study (RFGES) found that 40.3% of the general population met diagnostic criteria for at least one DGBI, representing a substantial economic and social burden on individuals and healthcare systems [3]. A subgroup analysis of the RFGES in Romania found a similar prevalence of 40.1% [4].

Dietary factors are known to play a substantial role in the symptomatology [5], development, and management [6, 7] of DGBI. A low fermentable oligosaccharides, disaccharides, monosaccharides and polyols (FODMAP) diet is recommended in irritable bowel syndrome (IBS) [8] few studies have examined the relationship between dietary intake and

Address for correspondence:

Prof. Dan L. Dumitrascu
Iuliu Hatieganu University of
Medicine and Pharmacy
Cluj-Napoca, Romania
ddumitrascu@umfcluj.ro

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symptoms of IBS in Koreans. The current cross-sectional study aimed to examine the diet in food consumption and nutrient intake in Korean adults aged 20 to 40 with IBS. The data collected were completed by 857 subjects using a community-based web survey. The questionnaire covered functional bowel disorders based on Rome III, the semi-quantitative Food Frequency Questionnaire (SQ-FFQ). In many cultures, fasting is practiced for different time intervals in observation of religious events. Fasting was defined in a recent consensus as “voluntary abstinence from some or all foods or foods and beverages” [9]. One type of fasting is religious fasting, as observed by Muslims, Greek-Orthodox, Jews, Jains [10], and Baha’i.

Information on the effect of prolonged fasting on health is limited [11] and related, in most cases, to diabetes. Data are available on the effect of fasting during Ramadan [12], and short time fasting for Yom Kippur, which were not associated with significant symptom exacerbation [13]. In Baha’i, a prolonged day-light fasting improves metabolic parameters [14]. Greek-Orthodox Christians observe several prolonged religious fasting periods: 6 weeks before Christmas in the winter, 7 weeks before Easter in the spring and 2 weeks for St Mary in the summer [15]. Furthermore, many observe weekly religious fasting on Wednesdays and Fridays, each lasting for 24 hours [15]. This type of fasting means adopting a strict vegan diet, where meat, fish, dairy products, eggs, and alcohol are forbidden [15]. Several studies report on the beneficial effects of a vegan diet during Orthodox fasting in Greece and Ethiopia [16-20]. 85.3% of Romanians follow Christian orthodox-Greek orthodox-Byzantine beliefs and practices [21]. Jains fast for nine days [10].

To our knowledge there are no scientific data on the effect of these alternating periods of vegan and normal diet specific to Greek-orthodox fasting on symptoms suggestive of DGBI. Thus, we aimed to find the percentage of those who observed religious fasting and possible associations between fasting and DGBI symptoms. We wanted to assess if the vegan fasting diet including fibers, fructose, and high FODMAPs is associated with symptoms of DGBI.

METHODS

Study Design, Setting, and Participants

Romania was one of 26 countries in the RFGES where data were collected nationwide on DGBI prevalence and burden via the Internet. A description of the methodology of this global study can be found in previously published papers [3, 4]. In Romania, as with the other 25 Internet-surveyed countries, the anonymous survey was carried out using a secure Internet system provided by Qualtrics, LLC (Provo, Utah, USA). The company recruited individuals across the country with national geographical representation and pre-determined quotas for sex and age. The minimum number of participants in each country was 2,000. Special measures, described elsewhere [3], were taken to ensure the accuracy and completeness of user responses by the Qualtrics system.

Variables, Data Sources, and Measurement

The RFGES questionnaire included core questions for all participating countries. These included the entire Rome IV

Adult Diagnostic Questionnaire to diagnose DGBI [22], and an extensive supplementary questionnaire on self-reported diagnosis of doctor-determined organic gastrointestinal disease, social and demographic characteristics, medical history, comorbidities, gastrointestinal infections, health care usage, drugs, living conditions, psychosocial variables, dietary habits, quality of life (QOL), and cultural and religious aspects. Several validated instruments were included: the Patient Health Questionnaire-12 (PHQ-12) [23] to assess the severity of somatic symptoms; the IBS symptom severity scale (IBS-SSS) [24]; the Personal Health Questionnaire-4 (PHQ-4) [25] to assess the presence of anxiety and depression; and the Patient-Reported Outcomes Measurement Information System Global-10 (PROMIS-10) questionnaire [26], to assess QOL. In addition, as described above, the Romanian survey included additional questions regarding Greek-Orthodox fasting (Table I).

Table I. Supplementary questions for Romanian participants in RFGES

1. Do you fast for Easter and Christmas (observe Greek-Orthodox fast)? (Yes/No)
If yes, please select the type of fast that you keep: (complete/partial)
2. Do you fast on Wednesday and Friday? (Greek-Orthodox weekly fasting) (both/Fridays or Wednesdays/sometimes/never)
3. Have you felt any of the listed symptoms while fasting? (Yes/No); If yes, please list them below (open question)
4. Are there some meals/drinks that you feel are associated with symptoms? (Yes/No); If yes, please list these meals/drinks (open question)

Responses to the open questions were recorded manually and transformed into qualitative variables stating the presence or absence of specific symptoms or meals/drinks. These questions were grouped into four symptom categories: general, digestive, caloric intake, and other, and marked as having the symptom (positive) or not having (negative).

Statistical Analyses

Qualitative data are described by absolute and relative frequencies. Associations between two qualitative variables were assessed with the chi-squared test or with the Fisher exact test (when expected frequencies were below 5). Comparisons between the three groups on ordinal data were performed with the Kruskal-Wallis test, followed by non-parametric post-hoc comparisons. For all statistical tests, two-tailed p-values were computed, and a value below 0.05 was considered statistically significant. All analyses were carried out with the R environment for statistical computing and graphics [27].

RESULTS

The total number of respondents in the survey was 2,049. The mean age was 42.19 years (SD=13.07), ranging from 18 to 81. The gender distribution was similar, 48.8% females (984) and 51.2% males (1,031). Thirty-four people were excluded from all Rome IV FGID diagnoses since they reported having been diagnosed with one or more non-DGBI gastrointestinal diseases (celiac disease, gastrointestinal cancer, or inflammatory bowel disease). Thus, our final

study sample had 2015 subjects. Thirteen subjects reported diverticulitis or bowel resection; therefore, they were excluded from bowel and anorectal disorders but not from esophageal, gastroduodenal, or biliary diagnoses. Detailed characteristics of all the Romanian respondents were presented in a previously published paper [3]. The median survey completion time was 23 minutes.

Fasting Description

Combining the two types of fasting, we found that 35.5% (716) of the respondents fasted. Of these 446 (22.1%) fasted for Easter and Christmas, 90 (20.59%) observed the entire fast, 625 (31.02%) practiced weekly fasting, of whom 167 (26.72%) fasted every week (Fig 1).

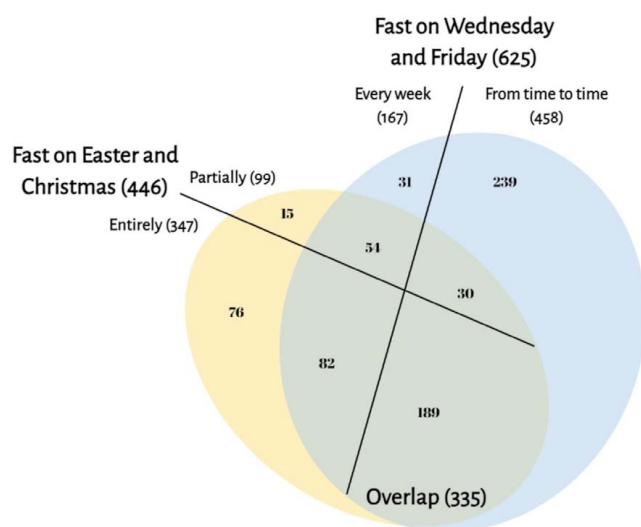


Fig. 1. Types of fasting within respondents.

Ninety (12.6%) reported symptoms during fasting, and 495 (24.6%) reported an association between symptoms and specific meals or drinks, when not fasting (Table II).

There were 90 answers (with one or multiple symptoms) to the open question regarding symptoms during fasting (Supplementary file). Considering the frequency of the symptoms reported to the number of participants who responded, overall, 56 (62.2%) had improvement of symptoms, 31 (34.4%) worsening of symptoms, and for 8 (8.8%) the evolution of symptoms could not be classified as improvement or worsening. Regarding digestive symptoms, 25 (27.78) were positive, the most frequent being diminished/absent bloating 11 (12.2%), 28 (31.11) were negative, the most frequent being bloating 12 (13.3%). Concerning general symptoms, 38 (42.2%) were positive, the most frequent being feeling better, 17 (18.9%), followed by feeling lighter, 9 (10%), and 3 (3.3%) were negative, the most frequent being feeling low energy 2 (2.2%).

DGBI and Fasting

There was no significant association between Orthodox fasting or weekly fasting and functional upper gastrointestinal disorders (Table III). The largest effect sizes related to fasting on Easter and Christmas as shown by odds ratios, were for functional heartburn (lower odds (0.35) in case of fasting),

Table II. The prevalence of different types of fasting

Question	Number (%) (n=2015)
Do you fast on Easter and Christmas (observe the Greek-Orthodox fast)?	
Yes	446/2015 (22.13)
If Yes, please select the type of fast:	
Partial (per this question)	347/437 (79.41)
Partial (per all subjects)	347/2015 (17.22)
Complete (per this question)	90/437 (20.59)
Complete (per all subjects)	90/2015 (4.47)
No answer (per all subjects)	9/2015 (0.45)
Do you fast on Wednesday and Friday? (Greek-Orthodox weekly fasting)	625/2015 (31.02)
Fridays or Wednesdays, from time to time (per this question)	428/625 (73.28)
Fridays or Wednesdays, from time to time (per all subjects)	458/2015 (22.73)
Fridays or Wednesdays, every week (per this question)	167/625 (26.72)
Fridays or Wednesdays, every week (per all subjects)	167/2015 (8.29)
No (per all subjects)	1390/2015 (68.98)
Any of the two above types of fasting	716/2015 (35.53)
Have you noticed any of the symptoms during fast/fasting periods?	
Yes	90/716 (12.57)
Are there some meals/ drinks that you feel are associated with symptoms? Yes	495/2015 (24.57)

and for chronic nausea and vomiting syndrome, and cyclical vomiting syndrome (higher odds (1.77 and 1.77) in case of fasting). The largest effect sizes related to fasting on Wednesdays and Fridays as shown by odds ratios, were for reflux hypersensitivity (lower odds (0.49) in case of fasting), and for rumination (higher odds (1.5) in case of fasting).

There was a significant association showing higher odds (2.09) of opioid-induced constipation for weekly fasting (Table IV). Close to the border of significance level there were higher odds (1.45) of functional bloating for weekly fasting. There were no other significant associations between Orthodox fasting, fasting adherence, and weekly fasting, and the other lower DGBI symptoms. The largest effect sizes related to fasting on Easter and Christmas as shown by odds ratios, was for levator ani syndrome (higher odds (3.54) in case of fasting). The largest effect sizes related to fasting on Wednesdays and Fridays as shown by odds ratios, were for opioid-induced constipation, levator ani syndrome, irritable bowel syndrome, and functional bloating (higher odds (2.09; 2.23; 1.56; and 1.45) in case of fasting).

Gastrointestinal Symptoms and Fasting

There was no significant association between Orthodox fasting or weekly fasting and upper gastrointestinal symptoms, except the frequency of experiencing pain or burning in the upper middle abdomen affecting daily activities (Supplementary file).

Table III. Associations between upper DGBI symptoms and fasting, n (%)

DGBI Disorder	Fasting on Easter and Christmas			Fasting on Wednesdays and Fridays		
	Yes (n=446)	No (n=1569)	OR (95% CI)	Yes (n=625)	No (n=1390)	OR (95% CI)
Functional heartburn	1 (0.22)	10 (0.64)	0.35 (0.04 - 2.74)	3 (0.48)	8 (0.58)	0.83 (0.22 - 3.15)
Functional chest pain	5 (1.12)	17 (1.08)	1.04 (0.38 - 2.82)	7 (1.12)	15 (1.08)	1.04 (0.42 - 2.56)
Reflux hypersensitivity	2 (0.45)	9 (0.57)	0.78 (0.17 - 3.63)	2 (0.32)	9 (0.65)	0.49 (0.11 - 2.29)
Globus	2 (0.45)	8 (0.51)	0.88 (0.19 - 4.15)	3 (0.48)	7 (0.5)	0.95 (0.25 - 3.7)
Dysphagia	14 (3.14)	41 (2.61)	1.21 (0.65 - 2.24)	20 (3.2)	35 (2.52)	1.28 (0.73 - 2.24)
Functional biliary pain	0 (0)	2 (0.13)	0 (0 - nc)	0 (0)	2 (0.14)	0 (0 - nc), 1
Postprandial distress syndrome	28 (6.28)	98 (6.25)	1.01 (0.65 - 1.55)	34 (5.44)	92 (6.62)	0.81 (0.54 - 1.22)
Functional dyspepsia	36 (8.07)	116 (7.39)	1.1 (0.74 - 1.62)	23 (3.68)	106 (7.63)	0.96 (0.67 - 1.38)
Belching	5 (1.12)	18 (1.15)	0.98 (0.36 - 2.65)	46 (7.36)	17 (1.22)	0.78 (0.31 - 2)
Rumination	10 (2.24)	35 (2.23)	1.01 (0.49 - 2.05)	6 (0.96)	27 (1.94)	1.5 (0.82 - 2.74)
CNVS	6 (1.35)	12 (0.76)	1.77 (0.66 - 4.74)	18 (2.88)	13 (0.94)	0.85 (0.3 - 2.41)
Cyclical vomiting syndrome	8 (1.79)	16 (1.02)	1.77 (0.75 - 4.17)	5 (0.8)	16 (1.15)	1.11 (0.47 - 2.62)

OR: odds ratio; CI: confidence interval; nc: not calculable; CNVS: chronic nausea and vomiting syndrome.

There were no significant associations between Orthodox fasting or weekly fasting and lower gastrointestinal symptoms, except the frequency of abdominal pain anywhere in the abdomen in the last 3 months, and the percentage of all bowel

movements with loose or watery stools that looked like Type 6 or 7 as depicted in the picture of the original study when not using medication or other constipation treatment, in the last 3 months (Supplementary file).

Table IV. Lower DGBI symptoms and fasting, n (%)

DGBI Disorder	Fasting on Easter and Christmas			Fasting on Wednesdays and Fridays		
	Yes (n=445)	No (n=1563)	OR (95% CI)	Yes (n=624)	No (n=1384)	OR (95% CI), P-value
Irritable bowel syndrome	14 (3.15)	57 (3.65)	0.86 (0.47 - 1.55)	29 (4.65)	42 (3.03)	1.56 (0.96 - 2.52)
Functional constipation	49 (11.01)	191 (12.22)	0.89 (0.64 - 1.24)	74 (11.86)	166 (11.99)	0.99 (0.74 - 1.32)
Opioid-induced constipation	9 (2.02)	20 (1.28)	1.59 (0.72 - 3.52)	14 (2.24)	15 (1.08)	2.09 (1 - 4.37)
Functional bowel disorder, Unspecified	37 (8.31)	134 (8.57)	0.97 (0.66 - 1.41)	57 (9.13)	114 (8.24)	1.12 (0.8 - 1.56)
Functional diarrhea	11 (2.47)	43 (2.75)	0.9 (0.46 - 1.75)	21 (3.37)	33 (2.38)	1.43 (0.82 - 2.48)
Functional bloating	31 (6.97)	95 (6.08)	1.16 (0.76 - 1.76)	49 (7.85)	77 (5.56)	1.45 (1 - 2.1)
Fecal incontinence	4 (0.9)	11 (0.7)	1.28 (0.41 - 4.04)	6 (0.96)	9 (0.65)	1.48 (0.53 - 4.19)
Levator ani syndrome	4 (0.9)	4 (0.26)	3.54 (0.88 - 14.19)	4 (0.64)	4 (0.29)	2.23 (0.55 - 8.93)
Proctalgia fugax	28 (6.29)	No (n=1563)	0.86 (0.56 - 1.32)	48 (7.69)	93 (6.72)	1.16 (0.81 - 1.66)

OR: odds ratio; CI: confidence interval. For abbreviations see Table III.

DISCUSSION

Our analysis of the Romanian subgroup of the Rome Foundation Global Study focused on fasting practices during Easter and Christmas and the traditional twice-weekly fasting on Wednesdays and Fridays. The aim was to examine the potential association of fasting with DGBI and symptoms of DGBI. We identified a high prevalence of fasting practice, but no statistically significant associations with DGBI. There were some associations between fasting and a few gastrointestinal symptoms, but these are likely to be spurious.

Few studies have investigated the prevalence of religious fasting. Most studies on religious fasting have included a group of fasting subjects and a control group. This methodology precludes assessment of the prevalence of fasting in general. Furthermore, most previous studies focused on a specific disease or a particular population group. For example, a population-based study on diabetic subjects during the Ramadan fast in thirteen countries found fasting rates of 42.8% and 78.7% for diabetes type 1 and type 2 patients, respectively [28].

To our knowledge, this study is the first to assess the prevalence of religious fasting in the Romanian population. In our study, 22.1% of the sample population fasted regularly on Easter and Christmas, indicating that a sizeable fraction of people followed these religious fasting traditions. Furthermore, a sizeable percentage of the population (31.02%) practiced weekly fasting on Wednesdays and/or Fridays. These results reflect the potential to investigate the possible impact of such fasting practices on general health and wellbeing.

Contrary to our *a priori* hypothesis, our study did not reveal a significant association between Greek-Orthodox fasting practices and DGBI. These findings challenge the belief that dietary restrictions and fasting, integral components of the Greek-Orthodox faith, exert a notable impact on gastrointestinal symptomatology. While past anecdotal evidence and certain cultural beliefs have suggested a potential link between fasting and improved digestive health, our results imply a more nuanced relationship.

There are several potential explanations for the lack of a significant association between Greek-Orthodox fasting and DGBI. First, the mechanisms underlying the influence of fasting on gastrointestinal symptoms are complex and multifaceted. Factors such as individual dietary preferences during fasting periods, the types of foods consumed, meal frequencies, and overall adherence to fasting rules may play a substantial role in mediating any potential effects on gastrointestinal function. It is plausible that the specific dietary choices made during fasting periods could counterbalance any potential benefits that fasting might confer on gastrointestinal health. Second, the intricate interplay between psychological factors induced by religious beliefs and cultural practices cannot be overlooked. It is conceivable that the emotional and psychological dimensions associated with fasting may have a direct impact or indirectly mitigate the perceived impact on gastrointestinal wellbeing. Third, our study did not identify whether the questionnaires were completed while fasting, as there are possible differences between DGBI symptoms during fasting or when reporting on fasting at the time of regular eating. Fourth, in case religious

propensity is genetically associated with certain gastrointestinal functionality, this might confound the observed results. Fifth, there is a complex interplay between psychological symptoms and religion, and between psychological symptoms and DGBI, which can influence one another. A review by Stewart et al. [29] demonstrated a positive association with God-reduced anxiety, while a negative one increased anxiety.

The study has limitations. The cross-sectional design limits our ability to establish causality or temporality in associations, thus prospective longitudinal investigations are warranted to further elucidate the temporal relationship between Greek-Orthodox fasting and DGBI. The study did not collect the data specifically during fasting periods and regular eating, but at a single point in time, precluding a closer analysis between fasting and symptomatology. Additionally, the assessment of dietary patterns and fasting adherence was reliant on self-reported data, introducing the potential for recall bias and misclassification of fasting habits. One of the questions about meals/drinks that the participants felt were associated with symptoms, did not specify gastrointestinal symptoms clearly. Thus, the participants may not have reported symptoms because they misunderstood the question. Future studies could incorporate objective measures of dietary intake and fasting adherence to enhance the accuracy of these assessments. Our study did not collect data on the duration or intensity of fasting. It is possible that these factors may have influenced the association between fasting and DGBI.

Our study has several notable strengths. To our knowledge, this is the first study to assess the association between the Greek-Orthodox fasting and all DGBI, and one of the few to assess the prevalence of Greek-Orthodox fasting altogether. The robust sampling methodology and the large sample size helped select a representative sample from the Romanian population that offers a representative image of religious fasting that can be generalized to the Romanian population. Our study provided precise estimates of fasting adherence during Easter, Christmas, and weekly fasting on Wednesdays and Fridays. These prevalence rates offer a comprehensive understanding of the frequency and extent of fasting within the study population. The assessment of functional gastrointestinal symptoms was facilitated by employing a validated and comprehensive questionnaire.

Future studies should be designed to assess DGBI symptomatology on a similar sample of participants during the fasting period and when eating regularly.

An interesting difference was noted with respect to the lack of positive influence of Greek-Orthodox fasting on digestive symptoms. While some studies report beneficial effects for Ramadan observers with respect to general health, gastrointestinal motility and presumably microbiota changes [30–32] we cannot assume that our participants felt better during fasting. A beneficial effect of fasting in the practitioners of Greek-Orthodox religion on the metabolic syndrome has also been reported [33], but was outside of the scope of our study.

CONCLUSIONS

Our study provides novel insights into the prevalence and the relationship between Greek-Orthodox fasting (i.e. vegan

diet) and DGBI and symptoms of functional gastrointestinal. Our representative sample showed that a substantial proportion of the Romanian population adheres to fasting practices. Contrary to expectations, we were not able to find significant evidence of strong associations with the prevalence of DGBI, or of gastrointestinal symptoms. The complex interplay between dietary choices, individual adaptations, and psychological factors may contribute to these findings.

Conflicts of interest: None to declare.

Authors' contributions: D.C.L. performed statistics and wrote the first draft. D.L.D. conceived the study, contributed to the writing of the paper, and is the guarantor of the article. S.I.B performed the statistics for original study, critical review of sub-study. A.D.S. co-conceived the original study, clinical input, critically revised the manuscript. O.S.P. co-conceived the original study, statistical input and critically revised the manuscript. All authors critically revised the manuscript, approved the final version to be published, and agreed to be accountable for all aspects of the work.

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REFERENCES

1. Drossman DA, Hasler WL. Rome IV—Functional GI Disorders: Disorders of Gut-Brain Interaction. *Gastroenterology* 2016;150:1257–1261. doi:10.1053/j.gastro.2016.03.035
2. Drossman DA. Functional Gastrointestinal Disorders: History, Pathophysiology, Clinical Features, and Rome IV. *Gastroenterology* 2016;150:1262–1279.e2. doi:10.1053/j.gastro.2016.02.032
3. Sperber AD, Bangdiwala SI, Drossman DA, et al. Worldwide Prevalence and Burden of Functional Gastrointestinal Disorders, Results of Rome Foundation Global Study. *Gastroenterology* 2021;160:99–114.e3. doi:10.1053/j.gastro.2020.04.014
4. Dumitrascu DL, Freud T, Ismael A, Bangdiwala SI, Palsson OS, Sperber AD. Epidemiology and Burden of Disorders of Gut-Brain Interaction in Romania: A Subgroup Analysis of the Rome Foundation Global Epidemiology Study. *J Gastrointest Liver Dis* 2022;31:273–282. doi:10.15403/jgld-4380
5. Chey WD. The role of food in the functional gastrointestinal disorders: introduction to a manuscript series. *Am J Gastroenterol* 2013;108:694–697. doi:10.1038/ajg.2013.62
6. Surdea-Blaga T, Cozma-Petrut A, Dumitrașcu DL. Dietary interventions and irritable bowel syndrome - what really works? *Curr Opin Gastroenterol* 2021;37:152–157. doi:10.1097/MOG.0000000000000706
7. Cozma-Petrut A, Loghiu F, Miere D, Dumitrașcu DL. Diet in irritable bowel syndrome: What to recommend, not what to forbid to patients! *World J Gastroenterol* 2017;23:3771–3783. doi:10.3748/wjg.v23.i21.3771
8. Na W, Lee Y, Kim H, Kim YS, Sohn C. High-Fat Foods and FODMAPs Containing Gluten Foods Primarily Contribute to Symptoms of Irritable Bowel Syndrome in Korean Adults. *Nutrients* 2021;13:1308. doi:10.3390/nu13041308
9. Koppold DA, Breinlinger C, Hanslian E, et al. International consensus on fasting terminology. *Cell Metabolism* 2024;36:1779–1794.e4. doi:10.1016/j.cmet.2024.06.013
10. Lakhani JD, Shah BD, Shah AP, Shah P, Shah CS. Ayambil; Jain Fast, Its Possible Health Effects. *J Integr Health Sci* 2023;11:51. doi:10.4103/jihs.jihs_6_23
11. Halawa A. Impact of intermittent dietary restriction on the health-related outcomes of faith-based fasting. *J Ethn Food* 2020;7:14. doi:10.1186/s42779-020-00047-3
12. Abbas Z. Gastrointestinal Health in Ramadan with Special Reference to Diabetes. *J Pak Med Assoc* 2015;65(5 Suppl 1):S68–S71.
13. Becker M, Karpati T, Valinsky L, Heymann A. The impact of the Yom Kippur fast on emergency room visits among people with diabetes. *Diabetes Res Clin Pract* 2013;99:e12–13. doi:10.1016/j.diabres.2012.10.005
14. Mähler A, Jahn C, Klug L, et al. Metabolic Response to Daytime Dry Fasting in Bahá'í Volunteers—Results of a Preliminary Study. *Nutrients* 2022;14:148. doi:10.3390/nu14010148
15. Lazarou C, Matalas AL. A critical review of current evidence, perspectives and research implications of diet-related traditions of the Eastern Christian Orthodox Church on dietary intakes and health consequences. *Int J Food Sci Nutr* 2010;61:739–758. doi:10.3109/09637481003769782
16. Gholampoor N, Sharif AH, Mellor D. The effect of observing religious or faith-based fasting on cardiovascular disease risk factors: A systematic review and meta-analysis. *Nutr Metab Cardiovasc Dis* 2024;34:1097–1109. doi:10.1016/j.numecd.2024.02.002
17. Rodopaios NE, Poullos E, Papadopoulou SK, et al. Association of Christian Orthodox Fasting with Sociodemographic, Anthropometric and Lifestyle Factors and Serum Biochemical Indices: A Cross-Sectional Study on Patients with Metabolic Diseases. *Metabolites* 2024;14:67. doi:10.3390/metabo14010067
18. Kokkinopoulou A, Katsiki N, Pagkalos I, et al. Association between Dietary Patterns and Metabolic Syndrome Risk Factors: A Cross-Sectional Study of Christian Orthodox Church Fasters and Non-Fasters in Greece. *Foods* 2023;12:3488. doi:10.3390/foods12183488
19. Kokkinopoulou A, Pagkalos I, Rodopaios NE, et al. Does Religious Fasting Have a Protective Role against Metabolic Syndrome in Individuals Aged >50 Years? *Nutrients*. 2023;15:3215. doi:10.3390/nu15143215
20. Michael A, Baye K. Ethiopian orthodox fasting is associated with weight reduction and body composition changes among healthy adults: a prospective cohort study. *Sci Rep* 2023;13:7963. doi:10.1038/s41598-023-35060-4
21. Anonymous. Recensământul Populației Și Locuințelor, Runda 2021 - Date Provizorii În Profil Teritorial. Presidential press release: Institutul Național de Statistică; 2022.
22. Palsson OS, Whitehead WE, van Tilburg MAL, et al. Development and Validation of the Rome IV Diagnostic Questionnaire for Adults. *Gastroenterology* 2016;150:1481–1491. doi:10.1053/j.gastro.2016.02.014
23. Kroenke K, Spitzer RL, Williams JBW. The PHQ-15: Validity of a New Measure for Evaluating the Severity of Somatic Symptoms. *Psychosom Med* 2002;64:258–266. doi:10.1097/00006842-200203000-00008
24. Francis CY, Morris J, Whorwell PJ. The irritable bowel severity scoring system: a simple method of monitoring irritable bowel syndrome and its progress. *Aliment Pharmacol Ther* 1997;11:395–402. doi:10.1046/j.1365-2036.1997.142318000.x
25. Kroenke K, Spitzer RL, Williams JBW, Löwe B. An Ultra-Brief Screening Scale for Anxiety and Depression: The PHQ-4. *Psychosomatics* 2009;50:613–621. doi:10.1016/S0033-3182(09)70864-3

26. Code Technology. PROMIS Global-10 | Patient-Reported Outcome Measure [Internet]. 2015. [Cited: 2023 May 15]. Available from: <https://www.codetechnology.com/blog/promis-global-10/>
27. R Core Team. A Language and Environment for Statistical Computing. Vienna: R Foundation for Statistical Computing; 2024.
28. Salti I, Bénard E, Detournay B, et al. A population-based study of diabetes and its characteristics during the fasting month of Ramadan in 13 countries: results of the epidemiology of diabetes and Ramadan 1422/2001 (EPIDDIAR) study. *Diabetes Care* 2004;27:2306–2311. doi:[10.2337/diacare.27.10.2306](https://doi.org/10.2337/diacare.27.10.2306)
29. Stewart WC, Wetselaar MJ, Nelson LA, Stewart JA. Review of the Effect of Religion on Anxiety. *Int J Depress Anxiety* 2019;2(2). doi:[10.23937/2643-4059/1710016](https://doi.org/10.23937/2643-4059/1710016)
30. Lauche R, Fathi I, Saddat C, et al. Effects of Modified Ramadan Fasting on Mental Well-Being and Biomarkers in Healthy Adult Muslims - A Randomised Controlled Trial. *Int J Behav Med* 2024 May 22. doi:[10.1007/s12529-024-10296-0](https://doi.org/10.1007/s12529-024-10296-0)
31. Di Ciaula A, Khalil M, Portincasa P. Ramadan intermittent fasting, a potential modulatory approach to gut microbiota and metabolic disturbances? *J Gastrointest Liver Dis* 2024;33:297-298. doi:[10.15403/jgld-5843](https://doi.org/10.15403/jgld-5843)
32. Abdallah H, Khalil M, Farella I, et al. Ramadan intermittent fasting reduces visceral fat and improves gastrointestinal motility. *Eur J Clin Invest* 2023;53:e14029. doi:[10.1111/eci.14029](https://doi.org/10.1111/eci.14029)
33. Giaginis C, Mantzorou M, Papadopoulou SK, Gialeli M, Troumbis AY, Vasios GK. Christian Orthodox Fasting as a Traditional Diet with Low Content of Refined Carbohydrates That Promotes Human Health: A Review of the Current Clinical Evidence. *Nutrients* 2023;15:1225. doi:[10.3390/nu15051225](https://doi.org/10.3390/nu15051225)