



Clinicians' Knowledge, Attitudes, and Practices Regarding the Management of Functional Gastrointestinal Disorders With Neuromodulators and Psychological Treatment

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Background/Aims

Little is known about the practical clinical application of neuromodulators and psychiatric treatments in patients with functional gastrointestinal disorders (FGIDs). We investigate the knowledge, attitudes, and practices of Korean clinicians regarding the use of neuromodulators and psychiatric treatments for FGIDs.

Methods

This prospective, online, cross-sectional study was conducted between May and August 2022. A questionnaire regarding the knowledge, attitude, and practice of neuromodulators and psychiatric treatments for FGIDs was developed and administered to primary care clinicians and gastroenterologists in university hospitals in Korea.

Results

Overall, 451 clinicians from primary (n = 179, 39.7%), secondary (n = 113, 25.1%), and tertiary (n = 159, 35.3%) hospitals participated in the survey. Most of them considered that neuromodulators (98.7%) and psychiatric treatment (86.5%) were required for patients with FGIDs. However, approximately one-third of them did not prescribe neuromodulators, mainly due to unfamiliarity with the drugs, and only one-quarter considered psychiatric referral. Compared to gastroenterologists at university hospitals, primary care clinicians' prescriptions had a lower rate (87.2% vs 64.2%, $P < 0.001$) and shorter duration of neuromodulator. The psychiatric referral rate was lower for primary care clinicians than for gastroenterologists at university hospitals (19.0% vs 34.2%, $P < 0.001$).

Conclusions

Knowledge, attitude, and practice levels regarding neuromodulators and psychiatric treatment among clinicians are inhomogeneous, and a knowledge gap exists between primary care clinicians and gastroenterologists at university hospitals. Encouraging ongoing education for Korean clinicians regarding the appropriate use of neuromodulators and psychiatric treatments in patients with FGIDs is suggested.

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Key Words

Gastroenterologists; Gastrointestinal diseases; Health knowledge, attitudes, practice; Neurotransmitter agents; Practice patterns, physicians'

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Introduction

The Rome IV criteria, updated by the Rome Foundation in 2016, redefined functional gastrointestinal disorders (FGIDs) as disorders of gut–brain interactions.¹ Dysfunction of the brain–gut axis is considered to be the biological basis for FGIDs. The brain–gut axis represents a network of connections allowing bidirectional communication between the central nervous system (CNS) and the enteric nervous system, including all types of communication.² The CNS can communicate with the gut via several mechanisms, including neuronal pathways, immune system signaling, and chemical signaling based on neurotransmitters and other metabolites.^{3,4} The CNS can regulate gut activity and affect the composition and function of the gut microbiota.³ Conversely, through these communication channels, the gut can influence the structure and function of the CNS, including mood, behavior, and cognition.⁵ When dysfunctional, these processes can lead to gastrointestinal (GI) disease development or progression.

Increasing research of the brain–gut axis has shed light on the concept of and therapeutic interventions for FGIDs. Agents working in both the brain and gut are now relabeled as gut–brain neuromodulators. This term includes central neuromodulators, such as antidepressants and antipsychotic agents, as well as peripheral neuromodulators, such as serotonergic agents.⁶ Neuromodulators, such as tricyclic antidepressants (TCAs) and selective serotonin-reuptake inhibitors, have been used to alter GI sensorimotor function and regulate symptoms, such as abdominal pain and bloating, in patients with FGIDs.⁶⁻⁸ These medications modulate the activity of neurotransmitters in the gut, improving motility, reducing sensitivity to pain, and enhancing symptom control.⁹⁻¹¹ Additionally, given the importance of the brain–gut axis, psychological interventions, such as cognitive-behavioral therapy, have also been suggested as effective treatment options. Psychological treatment has demonstrated efficacy in reducing symptoms and improving the quality of life in patients with FGIDs.¹²⁻¹⁵ However, despite growing evidence sup-

porting the use of neuromodulators and psychological treatments for FGIDs, how widely these treatments are utilized in clinical practice remains unclear. The knowledge, attitudes, and practices of clinicians regarding the management of FGIDs by means of neuromodulators and psychiatric treatments have not been studied extensively.

Therefore, in this study, we assessed the extent to which clinicians in Korea are aware of and use these treatment modalities for patients with FGIDs, and investigated their attitudes toward their use.

Materials and Methods

Study Design

We conducted a prospective cross-sectional study using an online survey of clinicians between May and August 2022. A 30-question survey, comprised of multiple-choice questions, was developed and distributed to clinicians working in various part of Korea. Eligible participants included gastroenterologists, internal medicine specialists, or other clinicians who may encounter patients with FGIDs in their practice. We strove to include not only clinicians from tertiary care hospitals but also clinicians from primary or secondary care hospitals.

Based on a comprehensive literature review and consultation with experts in this field, the Brain–Gut Axis Research Group of the Korean Society for Neurogastroenterology and Motility (KSNM) developed a survey questionnaire for use in this study. Other than a section recording the demographic and professional characteristics of the participant, the questionnaire was divided into 3 sections: (1) knowledge of the concept of the brain–gut axis and treatment options for FGIDs based on this concept, (2) attitudes towards the use of neuromodulators and psychiatric treatments for FGIDs, and (3) current practices in the management of FGIDs by means of neuromodulators and psychiatric treatment (Supplementary Table 1). In this questionnaire, psychiatric treatment refers to

interventions such as psychotherapy, cognitive-behavioral therapy, and the prescription of psychotropic medications administered by a psychiatrist.

This study adhered to the principles of the Declaration of Helsinki and was approved by the Ethics Committee of Chung-Ang University Hospital (IRB No. 2211-038-060). All participants provided informed consent before participating in the survey. No personal information was collected, and the participants were guaranteed confidentiality and anonymity of their responses.

Statistical Methods

All statistical analyses were performed using R software (version 3.6.3; R Core Team, 2022; <https://www.r-project.org/>). Continuous variables were summarized as means and standard deviations or interquartile ranges, while categorical variables were given as absolute (n) and relative frequencies (%). Pearson's chi-square test and Fisher's exact test were used to compare categorical variables. A logistic regression analysis was conducted performed to identify factors associated with to the prescription of neuromodulators. All tests were two-sided and differences were considered statistically significant at a significance level of 0.05.

Results

Study Population

Overall, 451 clinicians participated in this study. These comprised of gastroenterologists (mainly belonging to the KSNM as well as clinicians from other specialties (belonging to the Korean Physicians' Association [KAP] and The Korean Society of Digestive Endoscopy [KSDE])). We randomly sent questionnaires via e-mail to 281 clinicians from the KSNM (response rate: 71.2%) and 6134 clinicians from the KAP or KSDE (response rate: 7.0%). Table 1 shows the demographic characteristics of participants. Almost three-quarters of them were male, with the largest proportion of participants being in their 30s and 40s. The participants primarily belonged to the fields of gastroenterology, general medicine, and family medicine, which evenly represented doctors in primary clinics, secondary hospitals, and tertiary hospitals. Only 4.9% and 6.4% of participants reported that their institution had an FGID-specific psychiatric clinic and a psychiatrist interested in FGIDs, respectively.

Table 1. Demographic Characteristics of Participants

| Characteristics | N = 451 |
|---|------------|
| Age (yr) | |
| 20-29 | 3 (0.7) |
| 30-39 | 154 (34.1) |
| 40-49 | 166 (36.8) |
| 50-59 | 99 (22.0) |
| ≥ 60 | 29 (6.4) |
| Sex | |
| Male | 323 (71.6) |
| Female | 128 (28.4) |
| Specialty | |
| Gastroenterology | 171 (37.9) |
| General medicine | 137 (30.4) |
| Family medicine | 118 (26.2) |
| Surgeon | 14 (3.1) |
| Psychiatry | 1 (0.2) |
| Others ^a | 10 (2.2) |
| Institution | |
| Primary clinic | 179 (39.7) |
| Secondary hospital | 113 (25.1) |
| Tertiary hospital | 159 (35.3) |
| Years of practice (yr) | |
| 1-5 | 61 (13.5) |
| 6-9 | 90 (20.0) |
| 10-19 | 160 (35.5) |
| ≥ 20 | 140 (31.0) |
| Total patients/hour | |
| 1-5 | 95 (21.1) |
| 6-10 | 192 (42.6) |
| 11-15 | 111 (24.6) |
| ≥ 16 | 53 (11.7) |
| Proportion of FGID patients | |
| < 25% | 199 (44.1) |
| 25-49% | 182 (40.4) |
| 50-74% | 59 (13.1) |
| ≥ 75% | 11 (2.4) |
| Existence of FGID-specific psychiatric clinic | |
| Yes | 22 (4.9) |
| No | 429 (95.1) |
| Presence of a psychiatrist interested in the FGID | |
| Yes | 29 (6.4) |
| No | 254 (56.3) |
| Unknown | 168 (37.3) |

^aOthers: anesthesiology (n = 2), neurology (n = 3), and otolaryngology (n = 5). FGID, functional gastrointestinal disorder. Data are presented as n (%).

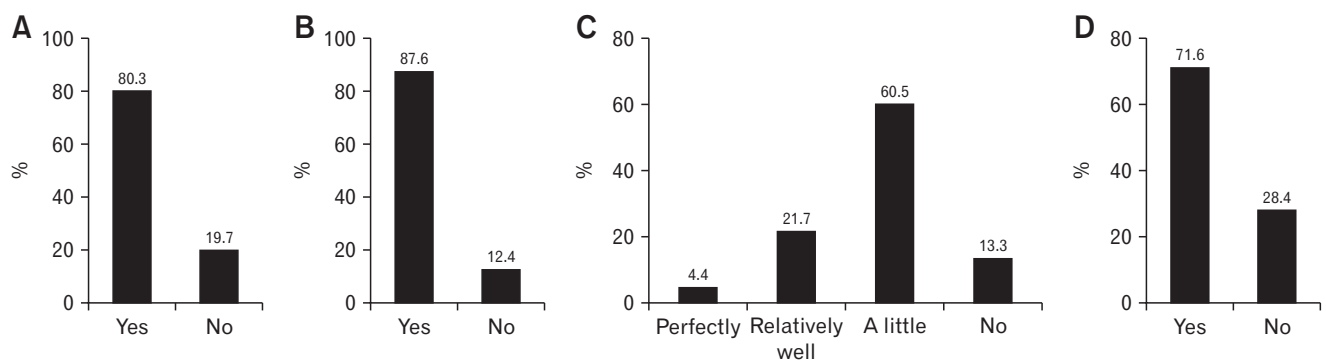


Figure 1. Knowledge of neuromodulators and psychiatric treatment for patients with functional gastrointestinal disorders (FGIDs). Distribution of answers to the following questions: (A) "Are you familiar with the term 'brain-gut axis' or 'gut-brain axis' or 'gut-brain interaction'?", (B) "Are you familiar with the term 'neuromodulator'?", (C) "Are you familiar with the side effects of neuromodulators?", (D) "Are you aware that psychiatric treatment may be used to treat FGIDs?"

Knowledge of Neuromodulators and Psychiatric Treatment in Functional Gastrointestinal Disorders

Most of the participants were familiar with the term "brain-gut axis," "gut-brain axis," or "gut-brain interaction" ($n = 362, 80.3\%$) (Fig. 1A), as well as with the term "neuromodulator" ($n = 395, 87.6\%$) (Fig. 1B). Most participants had accurate understanding of neuromodulators (Supplementary Fig. 1A). However, approximately 70% of respondents answered that they were not familiar with the side effects of neuromodulators (A little; $n = 273, 60.5\%$ and No; $n = 60, 13.3\%$) (Fig. 1C). Regarding psychiatric treatment, 71.6% of them answered that psychiatric treatment could be used to treat FGIDs (Fig. 1D). They were not well-informed about when to refer patients (Supplementary Fig. 1B).

When subgroup analyses were performed to compare primary care clinicians ($n = 179$) and gastroenterologists at university hospitals ($n = 117$), gastroenterologists at university hospitals were found to have a significantly higher level of knowledge than that of primary care clinicians regarding perceptions of the brain-gut axis, neuromodulators, and psychiatric treatment ($P < 0.001$) (Supplementary Table 2).

Attitude Regarding Use of Neuromodulators and Psychiatric Treatment for Patients With Functional Gastrointestinal Disorders

Almost all participants ($n = 445, 98.7\%$) indicated that neuromodulators are needed for patients with FGIDs.

When asked about the main purpose for using neuromodulators for patients with FGIDs, respondents most commonly answered that "Psychiatric etiologies, such as anxiety and depression,

play a role in the pathophysiology of FGIDs." ($n = 235, 52.8\%$), followed by "It normalizes brain-gut axis interactions" ($n = 192, 43.1\%$) (Fig. 2A). In a subgroup analysis, more than half of gastroenterologists at university hospitals ($n = 62, 53.0\%$) answered that "It normalizes brain-gut axis interactions"; however, only one-third ($n = 63, 35.2\%$) of primary care clinicians chose this answer. Rather, the latter group's most commonly chosen answer was "Psychiatric etiologies, such as anxiety and depression, play a role in the pathophysiology of FGIDs" ($n = 102, 58.3\%$) (Supplementary Table 2).

Regarding the effectiveness of neuromodulators for FGIDs patients, more than half of all participants presented a neutral response ($n = 287, 63.6\%$) (Fig. 2B).

Most participants ($n = 390, 86.5\%$) indicated that psychiatric treatments are needed for patients with FGIDs, and the most common answer regarding the reason was that "Psychiatric etiologies, such as anxiety and depression, play a role in the pathophysiology of FGIDs" ($n = 254, 65.1\%$), similar to the answer about the reason for neuromodulator use (Fig. 2C). Many participants were also neutral regarding the effectiveness of psychiatric treatment for patients with FGIDs ($n = 275, 61.0\%$) (Fig. 2D). Overall, 13.5% of participants indicated that psychiatric treatment was unnecessary for patients with FGIDs. The main reason for not requiring neuromodulators or psychiatric treatment was that patients disliked and refused to undergo such treatment (Supplementary Fig. 2).

Practice Regarding Neuromodulator Use in Treating Functional Gastrointestinal Disorders

Overall, 65.9% of clinicians were using neuromodulators in patients with FGIDs (Fig. 3A), with two-thirds using them in fewer

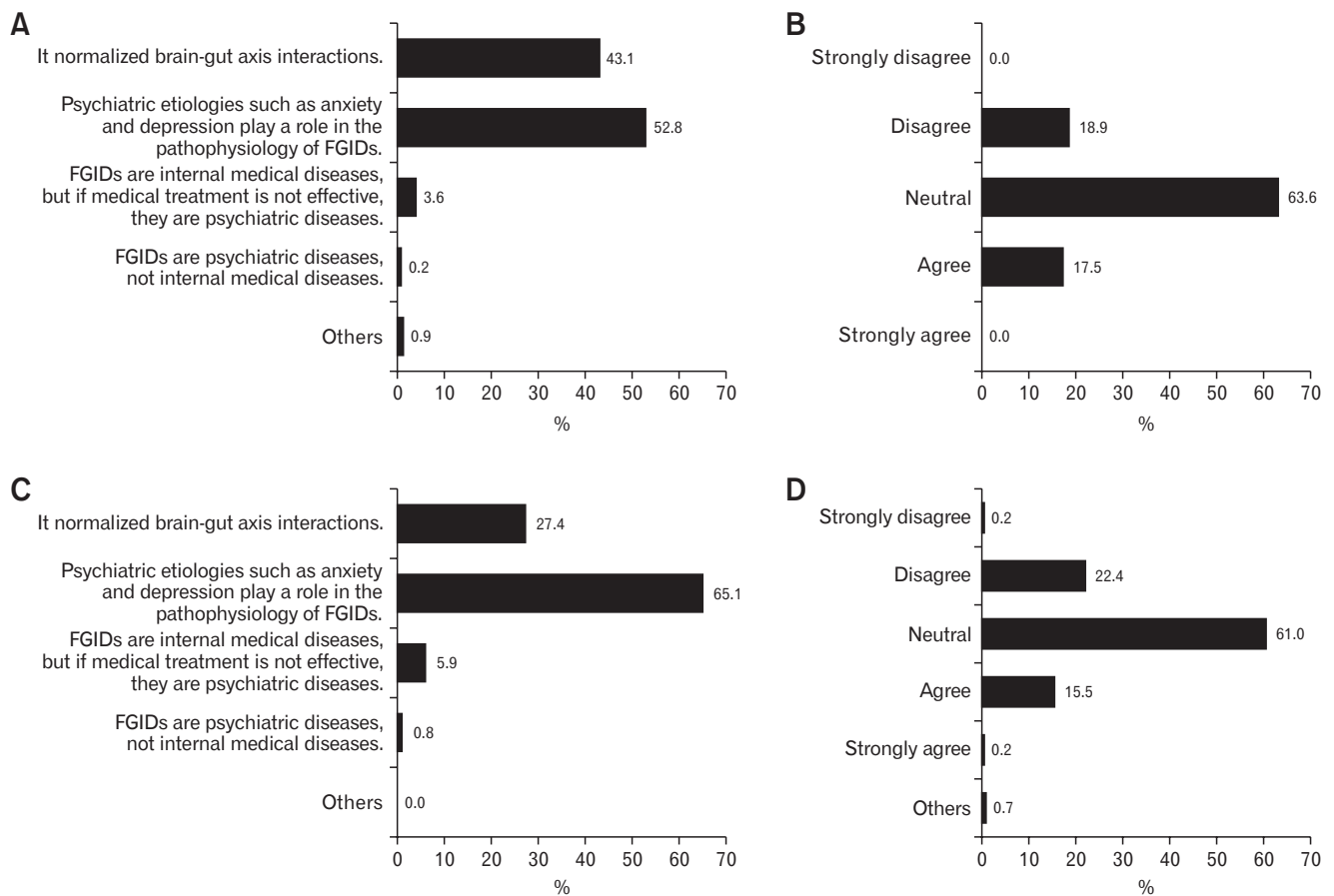


Figure 2. Attitude regarding neuromodulators and psychiatric treatment in functional gastrointestinal disorders (FGIDs). Distribution of answers to the following questions: (A) “What is the main reason for needing neuromodulators for patients with FGIDs?” (n = 445, participants who indicated that a neuromodulator is needed for patients with FGIDs). (B) “Do you think that neuromodulators are effective for patients with FGIDs?” (C) “What is the main reason for needing psychiatric treatment for patients with FGIDs?” (n = 390, participants who indicated that psychiatric treatment is needed for patients with FGIDs). (D) “Do you think that psychiatric treatments are effective for patients with FGIDs?”

than 25% of patients and one-third using them in more than 25% of their patients (Fig. 3B). Multivariate analysis demonstrated that the most critical factor in prescribing neuromodulators was knowledge of their side effects. Other associated factors were specialty, years of practice, and proportion of patients with FGIDs (Table 2). The purposes of neuromodulator use were relatively evenly distributed as shown in Supplementary Figure 3A. Approximately half of clinicians use the term “neurotic” to explain the etiology of FGIDs to patients (Supplementary Fig. 3B).

In subgroup analyses, primary care clinicians prescribed neuromodulators less often than did gastroenterologists at university hospitals, and their purpose for using neuromodulators was to manage anxiety, rather than relieve GI symptoms. Gastroenterologists at university hospitals prescribed neuromodulators more commonly to manage GI pain (Supplementary Table 3).

Prescription Pattern of Neuromodulators for Patients With Functional Gastrointestinal Disorders

We asked clinicians who responded that they prescribed neuromodulators (n = 297, 65.9%) about prescription patterns for patients with FGIDs (Supplementary Fig. 4).

In subgroup analyses, the most common time to decide whether to continue neuromodulators was 2-3 weeks after drug initiation, for gastroenterologists at university hospitals (n = 58, 56.9%), or less than 2 weeks after drug initiation, for primary care clinicians (n = 62, 53.9%) (Fig. 4A). The most common duration of maintaining neuromodulators was > 12 months among gastroenterologists at university hospitals (n = 39, 38.2%), while it was less than 3 months among primary care clinicians (n = 54, 47.0%) (Fig. 4B). Gastroenterologists at university hospitals

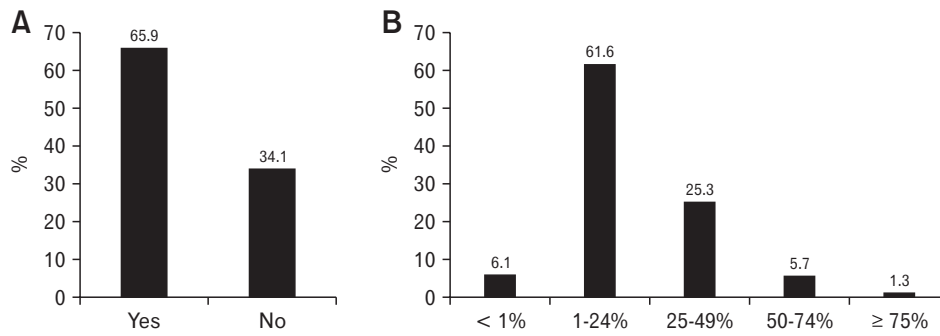


Figure 3. Practice regarding neuromodulator use for patients with functional gastrointestinal disorders (FGIDs). Distribution of answers to the following questions: (A) “Do you use neuromodulators for your patients with FGIDs?” (B) “What percentage of your patients with FGIDs are using neuromodulators?” (n = 297, participants who indicated they use neuromodulators for patients with FGIDs).

Table 2. Factors Affecting the Prescription of Neuromodulators (Univariate and Multivariate Analyses)

| | Univariate analysis | | | Multivariate analysis | |
|--|---------------------|------------|---------|-----------------------|---------|
| | Prescriber | Ref | P-value | OR (95% CI) | P-value |
| Specialty | | | < 0.01 | | |
| Gastroenterology | 135 (78.9) | 36 (21.1) | | 1.88 (1.15-3.01) | 0.012 |
| Others | 162 (57.9) | 118 (42.1) | | | |
| Years of practice | | | < 0.01 | | |
| ≥ 10 yr | 226 (75.3) | 74 (24.7) | | 3.06 (1.97-4.76) | 0.001 |
| < 10 yr | 71 (47.0) | 80 (53.0) | | | |
| Proportion of FGID patients/hour | | | < 0.01 | | |
| ≥ 50% | 184 (73.9) | 65 (26.1) | | 1.845 (1.81-2.89) | 0.007 |
| < 50% | 113 (55.9) | 89 (44.1) | | | |
| Knowledge about BGA | | | 0.003 | | |
| Yes | 251 (69.1) | 112 (30.9) | | 1.133 (0.67-1.91) | 0.641 |
| No | 46 (52.3) | 42 (47.7) | | | |
| Knowledge about term “neuromodulators” | | | 0.142 | | |
| Yes | 265 (67.1) | 130 (32.9) | | | |
| No | 32 (57.1) | 24 (42.9) | | | |
| Knowledge about S/E of neuromodulators | | | < 0.001 | | |
| Yes | 105 (89.0) | 13 (11.0) | | 4.04 (2.11-7.75) | < 0.001 |
| No | 192 (57.7) | 141 (42.3) | | | |

Ref, reference group; FGID, functional gastrointestinal disorder; BGA, brain–gut axis; S/E, side effects. Data are presented as n (%).

typically prescribed TCAs most commonly, while primary care clinicians prescribed TCAs and benzodiazepines in similar proportions. Gastroenterologists at university hospitals were more likely to prescribe were more likely to describe TCAs, noradrenergic and specific serotonergic antidepressants, and azapirones than were primary care clinicians (Fig. 4C). We identified unfamiliarity with neuromodulators as the most common reason for not using these drugs among both clinician groups, when we asked the clinicians who did not prescribe neuromodulators. For primary care clini-

cians, concerns regarding health insurance and patient reluctance were additional limiting factors (Fig. 4D).

Practice for Psychiatric Treatment in Functional Gastrointestinal Disorders

Of the participants, 76.5% answered that they would rarely recommended psychiatric treatment for patients with FGIDs (strongly disagree: n = 83 [18.4%] and disagree: n = 262, [58.1%]) (Fig. 5A). When asked to respond under which circum-

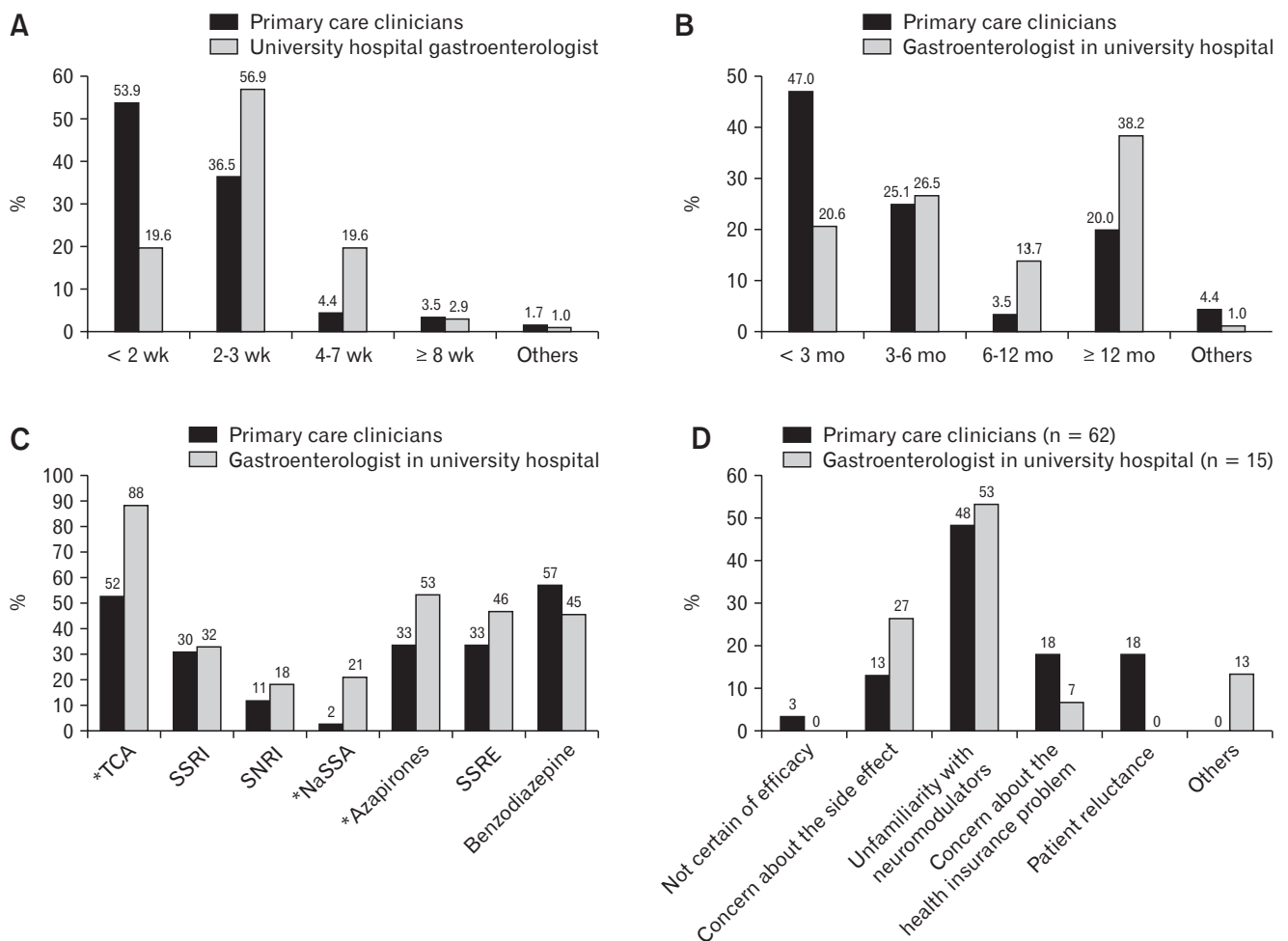


Figure 4. Comparison between primary care clinicians and gastroenterologists in university hospitals on the following questions of prescription patterns. (A) “What is the initial period of neuromodulator use in patients with functional gastrointestinal disorders (FGIDs)?”, (B) “How long are neuromodulators used if they are effective for patients with FGIDs?”, (C) “Which neuromodulator do you use for patients with FGIDs?” ($*P < 0.05$), (D) Comparison of the reasons for not prescribing neuromodulators (participants who indicated they did not use neuromodulators). TCA, tricyclic antidepressant; SSRI, selective serotonin-reuptake inhibitor; SNRI, serotonin–noradrenalin-reuptake inhibitor; NaSSA, noradrenergic and specific serotonergic antidepressant; SSRE, selective serotonin-reuptake enhancer.

stances participants would recommend psychiatric treatment, based on multiple answers, “severe anxiety” ($n = 227, 50.3\%$) and “severe depression” ($n = 232, 51.4\%$) were the most common responses. Additionally, 27.7% of participants answered, “when patients show suicidal tendencies.” In subgroup analysis, the percentage of participants who chose “when patients show suicidal tendencies” was significantly higher among gastroenterologists at university hospitals ($n = 55, 47.0\%$) than among primary care clinicians ($n = 17, 9.5\%$) ($P < 0.001$) (Supplementary Table 3).

Clinicians were asked about their referral patterns, and those who did not recommend psychiatric treatment were excluded ($n = 368, 81.6\%$). In terms of when participants would refer patients for

psychiatric treatment for FGIDs, more than half ($n = 234, 63.6\%$) of them referred patients to a psychiatrist if initial neuromodulators did not work, and approximately 20% answered that they referred patients to a psychiatrist as soon as neuromodulators were deemed necessary (Fig. 5B). The process following a referral for psychiatric treatment is described in the supplementary documents (Supplementary Fig. 5). The actual referral rate was significantly lower for primary care clinicians than for gastroenterologists at university hospitals (19.0% vs 34.2%, $P < 0.001$) (Supplementary Table 3).

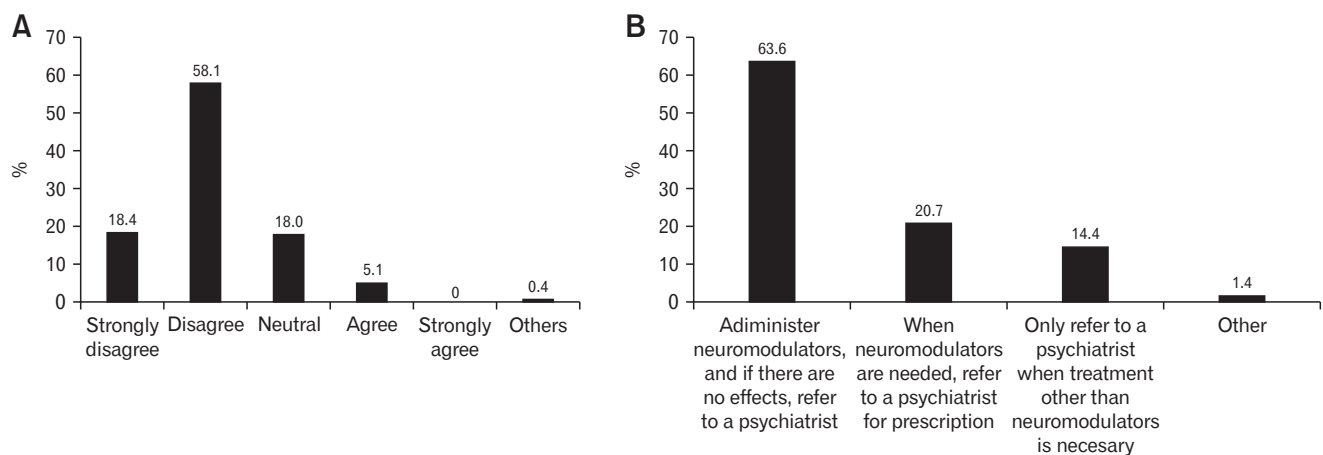


Figure 5. Practice regarding psychiatric treatments for patients with functional gastrointestinal disorders (FGIDs). Distribution of answers to the following questions: (A) “Do you recommend psychiatric treatment to patients with FGIDs?” (B) “What kind of psychiatric treatment do you provide when you treat patients with FGIDs?” (n = 368, excluding those who responded that they strongly disagreed with the recommendation of psychiatric treatment for patients with FGIDs).

Discussion

In the present survey, many Korean clinicians were found to be familiar with the “brain–gut axis,” “gut–brain axis,” or “gut–brain interaction.” Similarly, most clinicians indicated that they were familiar with the concept of “neuromodulators” and most had an accurate understanding. However, despite the overall understanding of neuromodulators, approximately two-thirds of clinicians prescribed them to only one-quarter of their patients with FGIDs.

The primary reason cited for not using neuromodulators was unfamiliarity with these medications, and a considerable proportion of clinicians reported unfamiliarity with the side effects associated with these agents. In addition, clinicians who were more knowledgeable about the side effects of neuromodulators were more likely to prescribe these agents. Thus, our findings suggest that clinicians who are well-informed about the potential side effects of neuromodulators and are capable of managing them prescribe these medications more frequently; conversely, clinicians who are unfamiliar with neuromodulators often hesitate to prescribe them due to a vague perception of their potential side effects. This result was consistent with that of a survey of gastroenterologists in the United States (US) regarding the use of central neuromodulators. They also cited the reason for not prescribing them as concerns about side effects.¹⁶ In a study that relied on a 2013–2017 prescriber database in the US, the proportion of gastroenterologists prescribing neuromodulators has been gradually decreasing, which is believed to be due to gastroenterologists’ unfamiliarity with the use of neuromodulators.¹⁷

Neuromodulators are known to cause side effects, on occasion, that are related to their mechanism of action.^{18–20} A previous systematic review and meta-analysis of eight randomized controlled trials reported a neuromodulator-related adverse event rate of 36.4%, as compared to a rate of 21.1% for placebo.¹³ However, no serious adverse events were reported with these drugs. These findings underscore the importance of appropriately educating clinicians about the effects and side effects of neuromodulators; doing so will improve the clinicians’ familiarity with these medications, thereby facilitating their appropriate use in the management of FGIDs.

In addition, the current study revealed that patients’ dislike or refusal to take neuromodulators was the main reason for considering neuromodulators or psychiatric treatment as unnecessary for patients with FGIDs. Although this study did not determine why patients dislike or refuse to take neuromodulators, other studies have shown that patients are also concerned about the side effects of neuromodulators.^{16,21–24} Addressing patients’ stigmas and misconceptions is another important aspect of FGID treatment.^{21,25–28} Thus, it is important to ensure that education about the side effects of neuromodulators is extended to both patients and clinicians.

A high percentage (98.7%) of participants acknowledged the necessity of using neuromodulators for treating patients with FGIDs, demonstrating that they recognized neuromodulators as an important part of managing FGIDs. However, when asked about the main reasons for the necessity of neuromodulators in patients with FGIDs, the most common response was that psychiatric etiologies, such as anxiety and depression, play a role in the pathophysiology of FGIDs. Similarly, the majority of clinicians (86.5%) indi-

cated that psychiatric treatments were needed for FGIDs patients, typically for the same reason as given above. These results showed that clinicians recognize the significant contribution of psychological factors to the pathophysiology of FGIDs. Approximately 50% of participants reported using the term “neurotic” to some extent when explaining the cause of FGIDs, which also suggested that the perception of a neurotic component contributing to the development of FGIDs prevails among some clinicians. We believe that clinicians should be made aware that FGIDs are currently defined as disorders of the brain–gut axis and that the primary purpose of using neuromodulators or psychiatric treatments is to treat these disorders.

More than half of the participants were neutral about the effectiveness of neuromodulators in patients with FGIDs. Considering that only 27% of US gastroenterologists reported that neuromodulators are effective in more than half of their patients with irritable bowel syndrome,¹⁶ it seems that the effectiveness of neuromodulators in FGIDs is still not fully recognized.

We speculated that primary care clinicians and gastroenterologists in university hospitals may differ in many respects and therefore conducted subgroup analyses to compare these 2 groups. As expected, our survey revealed significant differences in terms of the knowledge and perceptions between these 2 groups. Gastroenterologists at university hospitals exhibited a higher level of knowledge than did primary care clinicians in terms of understanding the brain–gut axis, neuromodulators, and psychiatric treatment. They were more likely to recognize the role of neuromodulators in normalizing brain–gut axis interactions. Primary care clinicians prescribed neuromodulators less often than did gastroenterologists at university hospitals, and their primary purpose in doing so was to manage anxiety, rather than to relieve GI symptoms. These differences translated into prescription patterns, with primary care clinicians being less likely and more reluctant to use neuromodulators for long periods. These differences can be explained by variations in knowledge and attitudes. These findings suggest the need for targeted educational interventions, particularly for primary care clinicians, to bridge the knowledge gap and ensure consistent understanding of neuromodulators across healthcare providers.

Our study and a US survey showed that TCAs are most commonly used for treating irritable bowel syndrome. In a US study, prescription patterns for serotonin–noradrenalin-reuptake inhibitors differed significantly among 10 world-recognized experts and US gastroenterologists. In contrast, our study showed that university-based gastroenterologists prescribed TCAs, noradrenergic and specific serotonergic antidepressant, and azapirone significantly

more often than did primary care clinicians. Although it is difficult to compare our study with the US survey directly, due to the completely different comparison groups, the use of TCAs in primary care in Korea seems to be relatively low as compared to that by US gastroenterologists. Moreover, Korean primary clinicians seemed to be unfamiliar with the use of neuromodulators other than TCAs.

In our study, the neuromodulator prescription patterns differed significantly between gastroenterologists at university hospitals and primary care clinicians. While clear guidelines for the use of neuromodulators for FGIDs are unavailable, these agents may be thoughtfully considered for patients who may not respond sufficiently to conventional treatments (administered over a sufficient period of time). Selection of the optimal neuromodulator should be based on the patient’s disease condition. To assess the efficacy of the medication selected, we recommend that treatment with it be continued for a minimum of 2–3 weeks; if a positive response is observed, the treatment can be maintained for a relatively longer period of over 3 months. Experts should continue their efforts to formulate these suggestions, and clinicians are encouraged to consider prescribing neuromodulators for patients who may benefit from them, in line with these suggestions. Such efforts will help reduce the clinicians’ biases and passive attitudes towards neuromodulators and facilitate the accumulation of sufficient experience with their usage.

Regarding psychiatric treatment for FGIDs, most clinicians (71.6%) acknowledged that psychiatric treatment could be used to treat these disorders and 86.5% indicated that psychiatric treatments are needed for patients with FGIDs. In contrast to the knowledge and attitudes toward psychiatric treatment, most participants (76.5%) reported rarely recommending psychiatric treatment for people with FGIDs. Similarly, 69.0% of US gastroenterologists also said that they found psychiatric referral difficult.¹⁶ These findings suggest that it is challenging for clinicians to use psychiatric treatments when managing patients with FGIDs in real practice. This may be due to various factors; however, based on the results of the knowledge section of our survey, we believe that many clinicians find it difficult to determine when psychiatric treatment is needed for FGIDs, and that insufficient psychiatric clinics are available for referral. In fact, many clinicians have a relatively low awareness of suicidal ideation, which is a major alarm sign for psychiatric care. This lack of knowledge and understanding highlights the need for clear guidelines and education to enhance the appropriate use of psychiatric interventions in patients with FGIDs.

In the subgroup analysis, university hospital gastroenterologists referred more patients to psychiatric treatment than did primary

care clinicians. The responses from clinicians at secondary hospitals, constituting approximately 25.0% of all responders, tended to align more closely with those of primary care clinicians. Possible factors contributing to this discrepancy include differences in the comorbid psychiatric diseases of patients, resources, access to specialists, or levels of collaboration and communication among healthcare providers.

This study reported on physicians' knowledge, attitudes, and practices regarding neuromodulators and psychiatric treatment by comparing university gastroenterologists and primary clinicians. However, this study has some limitations. First, sampling bias may have existed. As online surveys rely on self-selection, certain demographic groups, such as those interested in FGIDs, may have been overrepresented, leading to results that did not accurately reflect all clinicians. Second, online surveys are prone to response bias, as participants may not answer questions honestly or accurately. In addition, misunderstandings or misinterpretations of survey questions may exist, potentially affecting the accuracy of the responses. Although there is a diversity of medications classified as neuromodulators, another limitation is that we could not include specific questions about each type in the survey. Moreover, some of the questions were subjective in nature, and their responses were difficult to verify in practice. However, such questions can still facilitate an understanding of the environmental factors that influence the actual clinical practices of physicians. Finally, various demographic factors, including clinical experience, specialty, and working institution, may have influenced the results of this study.

In conclusion, most Korean clinicians who responded to our survey were interested in the use of neuromodulators and psychiatric treatments for patients with FGIDs. However, their familiarity with these treatment modalities and their knowledge of the associated side effects and optimal treatment duration were insufficient. This has led to a passive attitude towards these treatments, limiting their use, and this trend was even more pronounced among primary care clinicians. Continued education based on these findings is needed to ensure appropriate use of neuromodulators and psychiatric treatment in patients with FGIDs.

Supplementary Materials

Note: To access the supplementary tables and figures mentioned in this article, visit the online version of *Journal of Neurogastroenterology and Motility* at <http://www.jnmjournal.org/>, and at <https://doi.org/10.5056/jnm23161>.

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