

Original Article



A Nationwide Survey on Gastrointestinal Endoscopy Practice Patterns among Pediatric Endoscopists in South Korea

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ABSTRACT




Purpose: Gastrointestinal (GI) endoscopy is an important tool for diagnosing and treating GI diseases in children. This study aimed to analyze the current GI endoscopy practice patterns among South Korean pediatric endoscopists.

Methods: Twelve members of the Korean Society of Pediatric Gastroenterology, Hepatology and Nutrition developed a questionnaire. The questionnaire was emailed to pediatric gastroenterologists attending general and tertiary hospitals in South Korea.

Results: The response rate was 86.7% (52/60), and 49 of the respondents (94.2%) were currently performing endoscopy. All respondents were performing esophagogastroduodenoscopy, and 43 (87.8%) were performing colonoscopy. Relatively rare procedures for children, such as double-balloon enteroscopy (DBE) (4.1%), endoscopic retrograde cholangiopancreatography (ERCP) (2.0%), and endoscopic ultrasound (EUS) (2.0%), were only performed by pediatric gastroenterologists at very few centers, but were performed by adult endoscopists in most of the centers; of all the respondents, 83.7% (41/49) performed emergency endoscopy. In most centers, the majority of the endoscopies were performed under sedation, with midazolam (100.0%) and ketamine (67.3%) as the most frequently used sedatives.

Conclusion: While most pediatric GI endoscopists perform common GI endoscopic procedures, rare procedures, such as DBE, ERCP, and EUS, are only performed by pediatric gastroenterologists at very few centers, and by adult GI endoscopists at most of the centers. For such rare procedures, close communication and cooperation with adult GI endoscopists are required.

Keywords: Endoscopy; Child; Adolescent; Surveys and questionnaires; Korea

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Conflict of Interest

The authors have no financial conflicts of interest.

INTRODUCTION

In the last three decades, gastrointestinal (GI) endoscopy in the pediatric population has evolved with an increasing number of diagnostic and therapeutic applications. In pediatric endoscopy, technical improvements in endoscope design and endoscopic devices have advanced [1]. As pediatric GI endoscopy continues to progress, pediatric gastroenterologists are often called upon to develop and direct dedicated pediatric endoscopy units [2].

Experienced pediatric endoscopists should perform pediatric endoscopies in fully established pediatric endoscopic units under ideal conditions [3]. However, as such conditions are difficult to perfectly equip, pediatric endoscopy is sometimes performed by adult endoscopists at many centers [1]. Most pediatric gastroenterologists are not fully experienced or trained in performing invasive and higher-risk endoscopic procedures, as these are relatively uncommon in pediatric practice compared with those in adults [4]. The American Society for Gastrointestinal Endoscopy recommends that adult therapeutic endoscopists coordinate their services with a pediatric specialist when there is a need for an advanced endoscopic procedure in children [5].

A pediatric endoscopic practice pattern survey in North America was implemented by the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) to assess the practice patterns, volumes, and indications for common pediatric endoscopy procedures [4]. They characterized the North American practice patterns for diagnostic and therapeutic pediatric endoscopic procedures [4].

To the best of our knowledge, no study in South Korea has investigated the status of the current pediatric endoscopy practices. This study aimed to evaluate the practice patterns of GI endoscopy among pediatric endoscopists in South Korea. This nationwide pediatric endoscopy practice pattern survey also aimed to identify problems related to real-world practice among pediatric GI endoscopists.

MATERIALS AND METHODS

Questionnaire development

Twelve members of the Korean Society of Pediatric Gastroenterology, Hepatology, and Nutrition developed a 15-minute questionnaire comprising 77 items. The questionnaire consisted of (i) practice patterns and diagnostic and therapeutic endoscopy numbers, (ii) the proportion of endoscopies performed by an adult endoscopist, (iii) satisfaction with performing endoscopy in each hospital, and (iv) assistance from other departments, such as endoscopic biopsy reading or endoscopy sedation. We also surveyed the overall satisfaction level of the pediatric GI endoscopy environment by grading it from 1 to 10, with 1 being completely dissatisfied and 10 being fully satisfied.

Survey subjects and response collection

The survey request was sent by email in July 2020 to GI endoscopy subspecial board-eligible pediatricians working at hospitals equipped with a GI endoscopy device. Responses were collected via an online survey platform, and all answers were collected and processed anonymously to avoid response bias.

Statistical analysis

Descriptive statistical analyses were performed using IBM SPSS Statistics for Windows (version 24.0; SPSS Inc.).

Ethics statement

This study was conducted with the approval of 16 participating institutions, including the Institutional Review Board (IRB) of Soonchunhyang University Bucheon Hospital (IRB No. 2020-03-022-002), and the requirement for informed consent was waived owing to the nature of the study.

RESULTS

Baseline characteristics of pediatric endoscopy practice patterns

We found 89 GI endoscopy sub-special board eligible pediatricians in South Korea at the time of the survey. Among them, 60 were attending at centers with GI endoscopy devices. The questionnaires were collected from 52 of the 60 pediatric gastroenterologists (86.7% response rate). Among the respondents, 63.5% (33/52) were attending at tertiary hospitals, 34.6% (18/52) at secondary hospitals, and 1.9% (1/52) at primary general hospitals. The number of pediatric GI endoscopists according to their current hospital geographical location in South Korea is shown in **Fig. 1**. The demographic characteristics of the respondents are shown in **Table 1**.

Pediatric GI endoscopy performance status

Among the respondents, 94.2% (49/52) answered that they were currently performing endoscopy. All of them (100%) were performing esophagoduodenogastroscopy (EGD), and 87.8% (43/49) were performing colonoscopy. Thirty-three (67.3%) were performing colonoscopic polypectomy, and 25 (51.0%) were performing percutaneous endoscopic gastrostomy (PEG) (**Fig. 2**). The number of EGD and colonoscopies performed by an endoscopist per year is shown in **Fig. 3**.

Coworking with adult GI endoscopists

Of the 49 respondents currently performing endoscopies, 6.1% (3/49) were performing EGD, and 7.0% (3/43) were performing colonoscopy with the support of adult GI endoscopists. Meanwhile, all of the respondents (100.0%) who were performing endoscopic retrograde

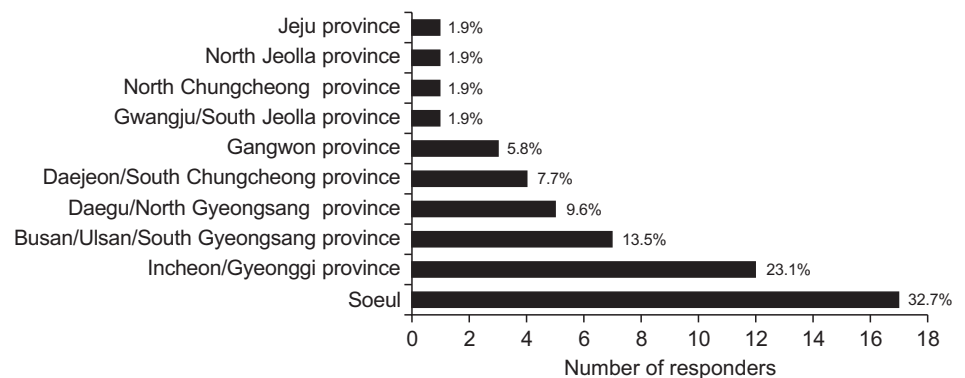


Fig. 1. Geographical location of hospitals in South Korea where the pediatric gastrointestinal endoscopists were attending.

Table 1. Baseline demographic characteristics of pediatric gastrointestinal endoscopists

Variable	Pediatric endoscopists (n=52)
Sex (male:female)	24:28
Age (yr)	
30–39	15 (28.8)
40–49	24 (46.2)
50–59	0 (19.2)
≥60	3 (5.8)
Type of attending hospital	
Tertiary hospital	33 (63.5)
Secondary hospital	18 (34.6)
Primary hospital	1 (1.9)
The year of starting endoscopy	
1990–1994	6 (11.5)
1995–1999	6 (11.5)
2000–2004	5 (9.6)
2005–2009	12 (23.1)
2010–2014	16 (30.8)
2015–2018	7 (13.5)
Duration of endoscopy (yr)	
1–5	13 (25.0)
6–10	14 (26.9)
11–15	11 (21.2)
16–20	7 (13.5)
21–25	4 (7.7)
26–30	3 (5.8)

Values are presented as number only or number (%).

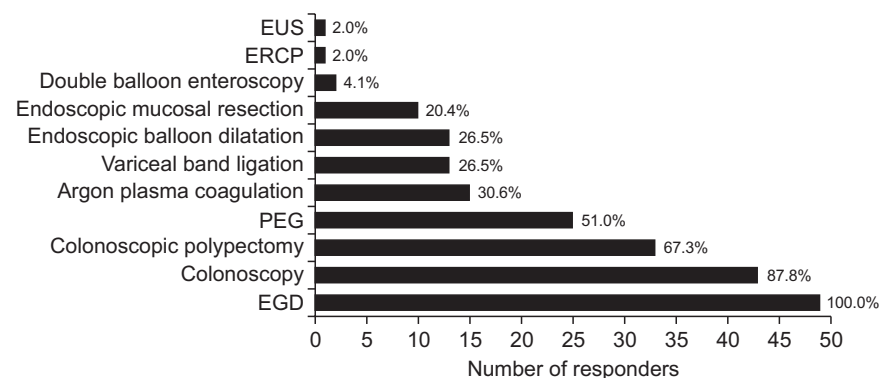


Fig. 2. Types and number of procedures performed by pediatric gastrointestinal endoscopists in South Korea. EUS: endoscopic ultrasound, ERCP: endoscopic retrograde cholangiopancreatography, PEG: percutaneous endoscopic gastrostomy, EGD: esophagogastroduodenoscopy.

cholangiopancreatography (ERCP), endoscopic ultrasound (EUS), or double-balloon enteroscopy (DBE) answered that these procedures were performed with the assistance of adult GI endoscopists (Fig. 4).

Emergency endoscopy

Emergency endoscopies were performed by 83.7% (41/49) of the respondents performing endoscopies. Fourteen of the 49 (28.6%) respondents were dissatisfied with the conditions for performing emergency endoscopies because of the lack of expert assistants and equipment allocated to pediatric endoscopy, difficulty waiting on call all year round, and inadequate financial compensation.

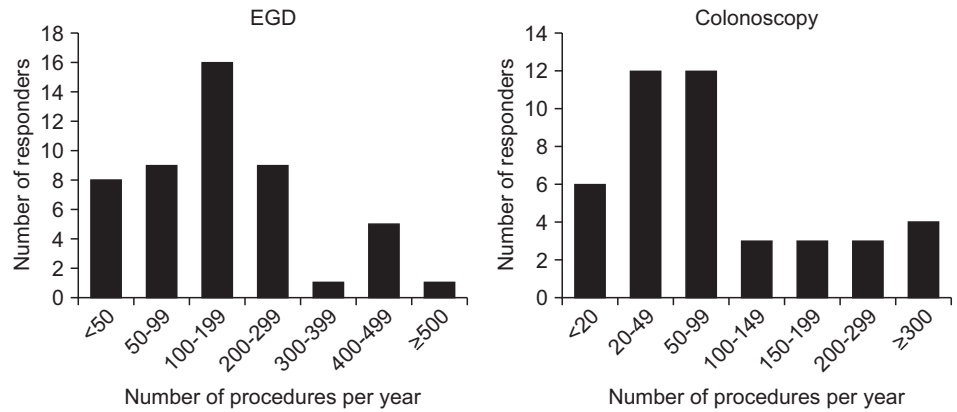


Fig. 3. Number of EGDs and colonoscopies performed per year by endoscopists in South Korea. EGD: esophagogastroduodenoscopy.

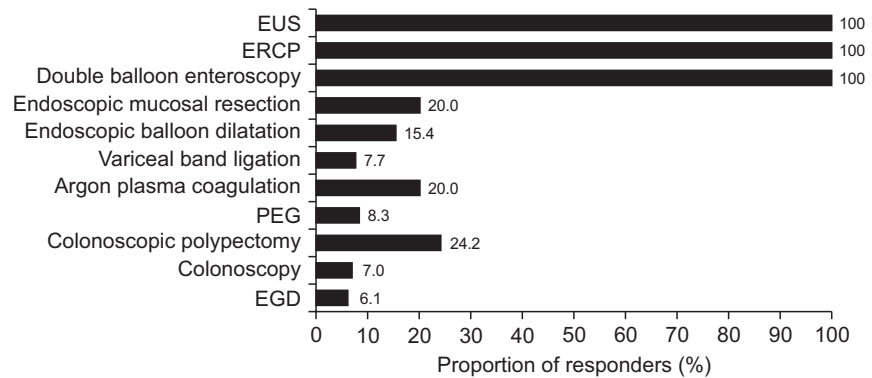


Fig. 4. Proportion of procedures performed by pediatric gastrointestinal endoscopists with the assistance of adult gastrointestinal endoscopists in South Korea. EUS: endoscopic ultrasound, ERCP: endoscopic retrograde cholangiopancreatography, PEG: percutaneous endoscopic gastrostomy, EGD: esophagogastroduodenoscopy.

Endoscopic biopsy

Thirty-five of the 49 respondents performing endoscopies (71.4%) reported that endoscopic biopsy indications were dependent on the patient's clinical manifestations. Ten (20.4%) respondents answered that routine biopsy was performed in spite of the absence of lesions. GI pathologists performed the endoscopic biopsy readings for 79.6% (39/49) of the respondents, pediatric pathologists for 4.1% (2/49), and general pathologists for 14.3% (7/49).

Sedation during endoscopy

Only 1 of the 49 respondents performing endoscopies (2.0%) stated that an anesthesiologist performed the sedation; the remaining respondents answered that sedation was performed by a pediatric GI endoscopist. Midazolam (100.0%), ketamine (67.3%), and propofol (30.6%) were the drugs used for sedation. Twenty-eight of the 49 respondents (57.1%) answered that endoscopies were sometimes performed under general anesthesia with the assistance of an anesthesiologist.

Satisfaction of performances

Of the 49 respondents performing endoscopies, 28 (57.1%) and 27 (55.1%) answered that their current conditions for performing pediatric ERCPs and DBEs, respectively, were adequate. Meanwhile, 37 (75.5%) answered that their condition for performing EUS was inadequate.

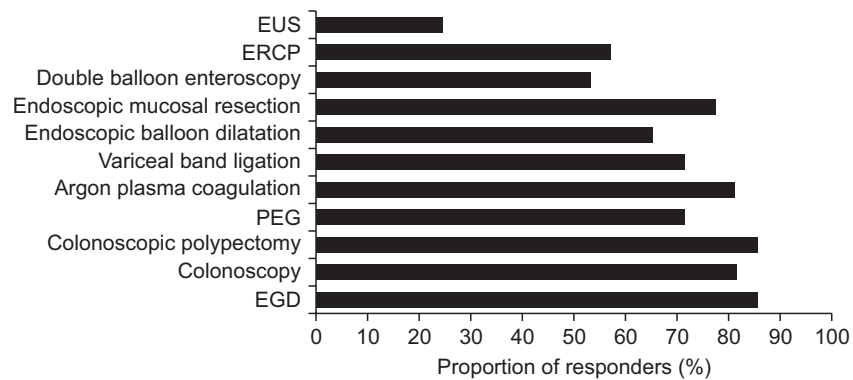


Fig. 5. Satisfaction of pediatric gastrointestinal endoscopists regarding the current performance status of each procedure at their attending hospital. EUS: endoscopic ultrasound, ERCP: endoscopic retrograde cholangiopancreatography, PEG: percutaneous endoscopic gastrostomy, EGD: esophagogastroduodenoscopy.

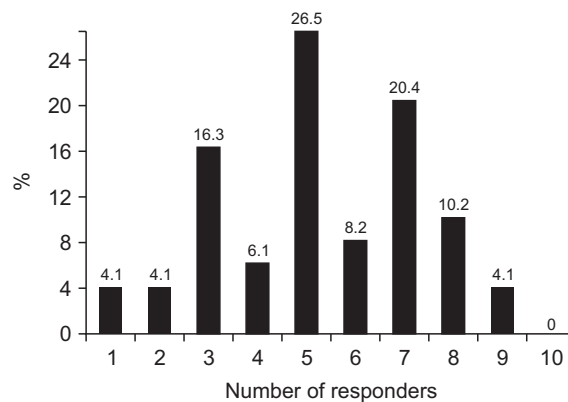


Fig. 6. Overall satisfaction level of pediatric gastrointestinal endoscopists regarding the current performance status of the procedures at their attending hospital.

Satisfaction with the conditions for performing EGDs, colonoscopies, and colonoscopic polypectomies was 85.7, 81.6, and 85.7%, respectively (**Fig. 5**). The most frequent score for pediatric GI endoscopists for overall satisfaction level regarding the current performance status of the procedures at their attending hospital was 5, followed by 7, and 3 (**Fig. 6**).

DISCUSSION

This study is the first to investigate GI endoscopy practice patterns among pediatric GI endoscopists in South Korea. While the majority of pediatric GI endoscopists performed common GI endoscopic procedures, rare procedures, such as DBE, ERCP, and EUS, were only performed by pediatric gastroenterologists in limited centers; instead, adult GI endoscopists performed pediatric procedures in most centers.

Owing to the technical progress in endoscopic devices and increasing indications for pediatric GI endoscopic procedures such as pediatric inflammatory bowel disease and other social circumstances, the number of pediatric endoscopy cases is increasing [6-8]. A considerable proportion of adult GI endoscopies are related to malignancy; however, pediatric endoscopies are mostly related to congenital diseases, anatomical anomalies,

foreign body ingestion, and other inflammatory conditions. Pediatric GI endoscopy differs from adult procedures in terms of indications and purposes [1]. Therefore, to ensure proper pediatric GI endoscopy, the endoscopist must not only understand the procedure itself but also pediatric diseases and children. Moreover, the relatively small weight of children makes the procedure technically difficult, and poor cooperation makes it even more difficult. Moreover, sedation risk is thought to be higher in children [9]. This implies that many disciplines are required for pediatric endoscopy. However, the number of pediatric endoscopy cases is much smaller than that of adults. Therefore, achieving proper proficiency in pediatric endoscopy is challenging.

More than half of the pediatric endoscopists are intensively distributed in the greater Seoul district. Such uneven distribution of medical services is not limited to pediatric gastroenterology, and should not be an excuse for the likelihood of unmet medical needs. With this uneven distribution, emergency endoscopy, which may be required at any time, for procedures such as foreign body removal or endoscopic GI bleeding control, is virtually impossible, especially in areas with only one practicing endoscopist. In terms of endoscopic experience, a considerable number of endoscopists had a maximum of 10 years of experience. Thus, pediatric GI endoscopy is a relatively new and emerging field of medical practice.

Among the various endoscopic procedures, relatively simple procedures such as EGD and colonoscopy are most frequently performed by pediatric endoscopists. However, they rarely perform complex treatment procedures, such as endoscopic mucosal resection, endoscopic balloon dilatation, and ERCP. Similar practice patterns were observed in previous surveys conducted in North and Central America; however, the number of therapeutic or complex endoscopic procedures performed by pediatricians is lower in Korea, except for polypectomy (polypectomy 67.3 vs. 56.7%; PEG insertion 51.0 vs. 83.3%; argon plasma coagulation 30.6 vs. 61.7%; variceal band ligation 26.5 vs. 53.3%; endoscopic balloon dilatation 26.5% vs. 85.0% in upper, 78.3% in lower; DBE 4.1 vs. 30.0%; ERCP 2.0 vs. 30.5%; EUS 2.0 vs. 6.8%; respectively) [4]. This may be related to differences in medical delivery systems, technical backgrounds, and pediatric GI training systems between North/Central America and Korea.

In terms of the number of endoscopies performed, most pediatric endoscopists answered that they performed 100–200 EGDs and 50–100 colonoscopies annually, and this number was relatively low compared to adult endoscopies. The NASPGHAN Guidelines for Training in Pediatric Gastroenterology recommend that the minimum number of procedures for achieving competence should be greater than 100 EGDs and 120 colonoscopies [10]. While basic endoscopic diagnostic procedures seem to be performed by pediatric GI endoscopists on their own, several high-level procedures are either performed by adult GI endoscopists or assisted by them. This should be considered inevitable because the number of procedures in children is very small, and there may be matters of expertise.

Surprisingly, a considerable number of endoscopists performed emergency endoscopies despite insufficient support. However, according to the following answers, sustainability was questionable. A solution is required to relieve the burden of maintaining essential emergency medical services.

In the current survey, only approximately 20% answered that they performed protocol biopsy regardless of the presence or absence of overt mucosal lesions, as recommended by the ESPGHAN/ESGE guidelines [1]. However, it is not easy to apply such guidelines directly in

the Korean system, and for 14.7% of the respondents, a general pathologist interpreted the biopsy tissue, not a GI pathologist or a pediatric pathologist. Moreover, satisfaction with pathology reading was low (19/52).

Most of the endoscopists answered that they performed the sedation and procedures on their own. However, for safe and effective sedation during procedures, it is recommended to separate the endoscopist and the anesthesiologist. Therefore, it seems necessary to consider realistic measures to correct this issue [1,9].

Most respondents seemed to think that the environment for the implementation of endoscopy was appropriate, and this was the same for procedures that they did not perform on their own. A higher tendency of satisfaction with practice circumstances was observed in the procedures they performed themselves. However, satisfaction with the overall current status of pediatric endoscopy was not that high, with an overall mean score of 5.3.

This study had some limitations. As the current survey was a self-report form, we cannot guarantee the fidelity of the responses or the absence of reporting errors. Furthermore, the responses were collected in 2020; therefore, they may have been outdated. However, this is the first survey addressing this subject, and almost every pediatric gastroenterologist participated in the survey, including all of the largest centers in Korea. These results provide basic information for future prospective studies and medical policies.

In conclusion, this survey outlines the current status of pediatric GI endoscopy in South Korea. We also observed some potential problems and limitations of pediatric GI endoscopy procedures and training, such as uneven distribution of endoscopists, difficulty in sustainability, and problems with performing complex endoscopic procedures.

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