RAPID COMMUNICATION

Chronic gastrointestinal symptoms and quality of life in the Korean population

Jeong-Jo Jeong, Myung-Gyu Choi, Young-Seok Cho, Seung-Geun Lee, Jung-Hwan Oh, Jae-Myung Park,
Yu-Kyung Cho, In-Seok Lee, Sang-Woo Kim, Sok-Won Han, Kyu-Yong Choi, In-Sik Chung

Jeong-Jo Jeong, Myung-Gyu Choi, Young-Seok Cho, Jung-Hwan Oh, Jae-Myung Park, Yu-Kyung Cho, In-Seok Lee, Sang-Woo Kim, Sok-Won Han, Kyu-Yong Choi, In-Sik Chung, Department of Internal Medicine, the Catholic University of Korea, Seoul 137-040, South Korea
Seung-Geun Lee, Department of Biostatistics, University of North Carolina at Chapel Hill, NC, United States
Author contributions: Jeong JJ, Choi MG and Cho YS designed the research; Jeong JJ, Choi MG, Cho YS, Oh JH, Park JM, Cho YK, Lee IS, Kim SW, Han SW, Choi KY and Chung IS performed the research; Jeong JJ, Choi MG and Lee SG analyzed the data; Jeong JJ and Choi MG wrote the paper.
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Correspondence to: Myung-Gyu Choi, MD, Professor of Medicine, Division of Gastroenterology, Department of Internal Medicine, Kangnam St. Mary's Hospital, The Catholic University of Korea, #137-040, 505, Banpo-Dong, Seocho-Gu, Seoul 137-040, South Korea. choim@catholic.ac.kr
Telephone: +82-2-5902471 Fax: +82-2-5902387
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Abstract

AIM: To evaluate the prevalence of chronic gastrointestinal symptoms and their impact on health-related quality of life (HRQOL) in the Korean population.

METHODS: A cross-sectional survey, using a reliable and valid Rome II based questionnaire, was performed on randomly selected residents, between 18 and 69 years in age. All respondents were interviewed at their homes or offices by a team of interviewers. The impact of chronic gastrointestinal symptoms on HRQOL was assessed using the Korean version of the 36-item Short-Form general health survey (SF-36).

RESULTS: Of the 1807 eligible subjects, 1417 (78.4%: male 762; female 655) were surveyed. Out of the respondents, 18.6% exhibited at least one chronic gastrointestinal symptom. The prevalence of gastro-esophageal reflux disease (GERD), defined as heart-burn and/or acid regurgitation experienced at least weekly, was 3.5% (95% CI, 2.6-4.5). The prevalence of uninvestigated dyspepsia, irritable bowel syndrome (IBS) and chronic constipation based on Rome II criteria were 11.7% (95% CI, 10.1-13.5), 2.2% (95% CI, 1.5-3.1), and 2.6% (95% CI, 1.8-3.5) respectively. Compared with subjects without chronic gastrointestinal symptoms (n = 1153), those with GERD (n = 50), uninvestigated dyspepsia (n = 166) and IBS (n = 31) had significantly worse scores on most domains of the SF-36 scales.

CONCLUSION: The prevalence of GERD, uninvestigated dyspepsia and IBS were 3.5%, 11.7% and 2.2% respectively, in the Korean population. The health-related quality of life was significantly impaired in subjects with GERD, uninvestigated dyspepsia and IBS in this community.

INTRODUCTION

Functional gastrointestinal disorders (FGIDs) are highly prevalent in different geographic populations and cause a variety of gastrointestinal symptoms that greatly inconvenience the affected individuals[1,2]. According to a household survey in the United States, 69% of those questioned reported as having at least one of twenty functional gastrointestinal symptoms in the preceding three months[1]. In other population-based surveys, the prevalence of non-ulcer dyspepsia was approximately 30% and irritable bowel syndrome was 15%[2,3]. The prevalence of functional gastrointestinal disorders has been reported to differ based on the geographical region and race. Although the prevalence of such disorders in

Koreans is thought to be different from that in the Westerners, there has been no randomly sampled population-based study on the prevalence of chronic gastrointestinal symptoms in the Korean population.

The health-related quality of life (HRQOL) is a patient-focused concept, referring to an impairment of functional status (physical or mental) and the sense of well-being. As such, it is an important measure of the impact of chronic diseases. Several studies have shown that the HRQOL is significantly reduced in patients with chronic gastrointestinal symptoms in referral settings, compared with the general population, as well as in patients with other chronic conditions, such as GERD and asthma. However, there is a lack of evidence to support a decrease in the HRQOL in the general population having chronic GI symptoms[4,5].

The aims of the present study were to evaluate the prevalence of chronic gastrointestinal symptoms according to the Rome II criteria, and to determine whether the HRQOL is impaired in subjects having chronic gastrointestinal symptoms in the Korean community.

MATERIALS AND METHODS

Subjects
The study was carried out in Asan-si, Chungchungnam-do Province from January 3, 2000 to February 28, 2001. Asan-Si is a small city located in the middle of South Korea. The population comprises approximately 180 000 people, and is a combination of urban and farming community. Sociodemographic factors including age, sex, educational background and economic level of Asan-si are similar to the overall Korean population, based on the information obtained from the Korean National Statistical Office (http://www.nso.go.kr). We assumed a symptom prevalence of 40%; thus at least 1024 interviews were required to achieve the required precision of ± 3% with 95% confidence. Therefore, the target sample size was 1400. A cross-sectional survey was performed on randomly selected Asan-si residents, between 18 and 69 years of age. A lengthy consultation was made with the regional health office (RHO) to prepare the survey. For instance, the general regional information provided by the RHO helped to organize visits and complete other administrative activities. Ten out of Asan-si's 17 districts, with population size over 500 were randomly selected. Within each of these districts, a total of 200 households from every third street were chosen. The size, gender and age of all household members were obtained from the RHO database before the visit. Gender and age were used to stratify the households and one person in each household was selected by random sampling, before a list of selected individuals was compiled in each stratum. The regional health office checked the eligibility of the selected individuals by examining their medical records, followed by a telephone interview. Exclusion criteria included pregnant or lactating women, history of surgery of the GI tract including partial resection of the stomach and/or resection of the small/large intestine (subjects with an appendectomy were included), major psychosis, mental retardation or dementia, significant illness that may render them unable to complete the questionnaire, or had other nationalities. The revised list was used for actual household visit after excluding the ineligible individuals. Since only housewives and elderly individuals would be available during the day, we pre-scheduled the time and order of the house visits with the help of the regional health office.

Questionnaire
We developed a bowel symptom questionnaire to identify chronic gastrointestinal symptoms in adults, based on the Rome II criteria. The complete questionnaire was 22 pages long and included 130 questions, of which 103 were used to diagnose gastroesophageal reflux and chronic gastrointestinal symptoms. The bowel symptoms questionnaire was modified from the Mayo version of Bowel Symptoms Questionnaire[6] and several items were adopted from the Rome II criteria. The validation process consisted of forward and backward translation as well as confirming the patient's ability to understand. However, we did not perform test-retest reliability, because this was not a self-reported questionnaire, and trained interviewers visited homes and helped the subjects to complete the questionnaire. During the survey, a face-to-face interview was conducted to help describe certain parts of the Bowel Symptoms Questionnaire. Specifically, heartburn is not a term in the Korean language; therefore the symptoms had to be verbally described and a diagram indicating the location of the burning sensation was added to the questionnaire in order to help ensure that the subjects fully comprehended the medical conditions under investigation. The remaining 27 questions enquired about the sociodemographic characteristics, self-reported height and weight, physician visits, past illnesses, social habits (smoking, alcohol, and medication use), impact on everyday life, possible anxiety induced by the problem, as well as lifestyle changes that may have been relevant.

HRQOL was assessed by the Korean version of SF-36 (SF-36-K). We previously assessed the reliability, discriminant validity and concurrent validity of the SF-36-K before conducting this study. The SF-36-K was fully applicable and well understood by Korean patients, as well as healthy subjects. The reliability was assessed by using the test-retest method, and the internal consistency method. The test-retest method showed high correlation between the two tests. Cronbach's correlation alpha of all 8 subscales of the SF-36-K was > 0.73 (range, 0.73-0.96). Discriminant validity was supported by comparing the SF-36 score in 179 healthy subjects and 44 patients with gastrointestinal disorders. All 8 domains of the SF-36 were well correlated with subscores of the WHO Quality of Life Scale-K and the Psychological Well-Being Index. The SF-36 is a widely used general health profile questionnaire with 36 questions comprising eight scales: physical functioning (e.g. walking, lifting), role functioning-physical (limitations in ability to perform usual activities), role functioning-emotional (impact of emotional problems on work or

daily activities), social functioning (impact of health or emotional problems on social activities), bodily pain (level of bodily pain or discomfort), mental health (anxiety, depression, sense of psychological well-being), vitality (energy level or fatigue), and general health perceptions (global evaluations of health). The SF-36 is scored from 0 to 100 with higher scores indicating a better HRQOL.

Survey design

We conducted a cross-sectional survey of gastrointestinal symptoms and their impact on the quality of life (QOL) in Korean subjects in cooperation with the public health center. Before the survey, the questionnaire was explained to the health-care personnel of the Public Health Center to outline the purpose of the study and to request their participation. All subjects were interviewed in person at their homes or offices by a team of interviewers, all trained by the same physician (C.M.G.). The consistency and completeness of the completed questionnaire was checked after each interview.

Statistics

The 1807 eligible individuals interviewed can be considered as a representative sample of the Asan-si population. We calculated the prevalence of GERD and chronic gastrointestinal symptoms according to the Rome II criteria. The prevalence is presented in percentages with 95% exact confidence intervals (CI). Comparisons among groups were performed by the χ^2 test or Fisher's exact test for categorical data and t-test for continuous data. The association between prevalence rate and age in each group was tested by logistic regression model. Differences of SF-36 sub-scale scores between groups were estimated by ANCOVA model with adjustment of covariates. Pair-wise differences between groups without chronic GI symptoms and groups with chronic GI symptoms (GERD, UD and IBS) were tested by Bonferroni adjusted t-test. Gender, age, economic level and education variables were used for adjustment. A multiple regression model was performed for SF-36 sub-scale scores for individuals who had chronic GI symptoms. Gender, age, smoking, religion, education, economic level, physician visit and overlapping symptom variables were used as predictors. Statistical analyses were performed using SAS (SAS, Cary, NC, USA).

RESULTS

Response rate and subject characteristics

Among the randomly selected 2024 subjects, a total of 217 were not eligible to participate in the study. One hundred and twenty individuals were no longer living in Asan-si and 97 could not be interviewed due to physical or mental disorders. Out of the 1807 eligible subjects, 314 could not be contacted after three attempts, and 76 refused to participate. A total of 1417 (78.4%) of the 1807 eligible subjects returned the completed survey. Of these respondents, 762 were male (53.8%) and 655 were female (46.2%), with a mean age of 44 years. The demographic and socioeconomic features of the respondents are shown in Table 1.

Table 1 Characteristics of the study population n (%)

Variable	Male (n = 762)	Female (n = 655)	Total (n = 1417)
Age			
18-29	163 (11.5)	151 (10.7)	314 (22.2)
30-39	132 (9.3)	110 (7.8)	242 (17.1)
40-49	169 (11.9)	146 (10.3)	315 (22.2)
50-59	150 (10.6)	116 (8.2)	266 (18.8)
60-69	148 (10.4)	132 (9.3)	280 (19.7)
Median age (yr)	45	44	44
Mean age (yr)	44.1 ± 14.4	43.7 ± 15.1	43.9 ±14.8
BMI (kg/m²)	22.8	22.0	22.4
Ever tobacco smoker (%)	67.8[a]	4.0	38.3
Alcohol use (> 75 g/wk) (%)	36.4[a]	2.6	20.7
Marital status (single)[1] (%)	26.5	28.7	27.5
Employed (%)	85.4[a]	45.6	67.0
Presence of religion (%)	50.5[b]	65.0	57.2
High school graduate (%)	57.0[a]	49.2	53.4
Economic status (%)			
High	6.4	6.3	6.4
Middle	76.1	79.8	77.8
Low	17.5	13.9	15.8

[1]Marital status was divided into single or married/living as a couple. Single status was extended to include unmarried persons, divorced individuals and those with a deceased spouse [a]$P < 0.01$, [b]$P < 0.001$ compared to female.

Prevalence of chronic gastrointestinal symptoms

The prevalence of weekly episodes of heartburn and acid regurgitation was 2.0% (95% CI, 1.2-2.7) and 2.0% (95% CI, 1.3-2.8) respectively. The prevalence of GERD, defined as heartburn and/or acid regurgitation experienced at least weekly, was 3.5% (95% CI, 2.6-4.5). The prevalence of specific chronic gastrointestinal symptoms, according to the Rome II criteria is summarized in Table 2. At least one chronic gastrointestinal symptom was present in 18.6% of the 1417 respondents. The most prevalent chronic gastrointestinal symptom was uninvestigated dyspepsia (11.7%; 95% CI, 10.1-13.5). According to the subtypes of dyspepsia, dysmotility-like dyspepsia was the most prevalent (69.9%), followed by ulcer-like dyspepsia (28.3%) and non-specific dyspepsia (1.8%). Thirty one subjects (2.2%) fulfilled the Rome II criteria for the diagnosis of IBS (Table 2). Of these, 13 subjects (42%) were classified as diarrhea-predominant, and 12 (39%) constipation-predominant IBS. The remaining 6 subjects (19%) fell into the alternating IBS subgroup. There were no differences in the overall prevalence of IBS based on gender; however, compared to male subjects, females reported more frequent constipation-predominant IBS (IBS-C). Females also reported more frequent chronic constipation. There were no gender-based differences in the prevalence of the other chronic gastrointestinal symptoms (Table 2).

Age-specific prevalence of GERD, uninvestigated dyspepsia, and IBS are shown in Figure 1, and the odds ratio with 95% confidence interval are shown in Table 3. The prevalence of GERD and dyspepsia showed significant differences between different age groups (logistic regression, $P < 0.01$).

Physician visit and medication use

In the present population-based study, 50.5% of the

Table 2 Prevalence of chronic gastrointestinal symptoms, according to the Rome II criteria

Chronic gastrointestinal symptoms	n	Respondent (n = 1417) % (95% exact CI)	Male (n = 762) %	Female (n = 655) %
Globus	7	0.5 (0.2-1.0)	0.4	0.7
Chronic dysphagia	7	0.5 (0.2-1.0)	0.3	0.7
Rumination	0	0.0 (0.0-0.3)	0	0
Chronic chest pain	21	1.5 (0.9-2.3)	1.6	1.4
Chronic heartburn	24	1.7 (1.1-2.5)	1.8	1.6
Uninvestigated dyspepsia	166	11.7 (10.1-13.5)	10.8	12.8
IBS	31	2.2 (1.5-3.1)	1.8	2.6
IBS-D	13	0.9 (0.5-1.6)	1	0.8
IBS-C	12	0.8 (0.4-1.5)	0.1	1.7[a]
IBS-A	6	0.4 (0.2-0.9)	0.7	0.2
Chronic bloating	57	4.0 (3.1-5.2)	2.9	5.3
Chronic constipation	37	2.6 (1.8-3.6)	0.5	5.0[a]
Chronic diarrhea	11	0.8 (0.4-1.4)	0.8	0.8
Chronic incontinence	18	1.3 (0.8-2.0)	1.6	1.1

IBS: Irritable bowel syndrome; IBD-D: Diarrhea-predominant IBS; IBS-C: Constipation- predominant IBS; IBS-A: Alternating constipation and diarrhea IBS. [a]$P < 0.05$ (Fisher's exact test) compared to male.
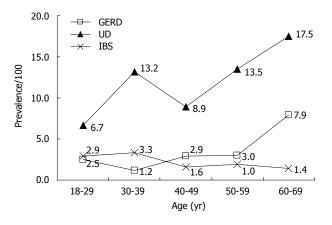

Figure 1 Age specific prevalence rate (per 100) of GERD, UD and IBS in Asan-si, Korea. GERD: Gastroesophageal reflux disease; UD: Uninvestigated dyspepsia; IBS: Irritable bowel syndrome.

subjects surveyed had experienced at least one gastro-intestinal symptom in the previous year, and 10.9% had reported visiting a physician due to their gastrointestinal symptoms. With regard to the use of medications, 5.7% of the respondents took non-steroidal anti-inflammatory drugs (NSAIDs), and 5.5% had taken anti-acid agents or antacids in the past year. More women took NSAIDs and constipation medications (Table 4).

Impact of chronic gastrointestinal symptoms on health-related quality of life

Of the 1417 respondents, 1153 individuals did not experience any chronic GI symptoms, while 198 subjects had features suggestive of GERD, UD or IBS, or a combination of these symptoms. There was no significant difference between the two groups with respect to gender, smoking, martial status and BMI ($P > 0.05$). However, age, education level and the number of physi-

Table 3 Association between age and chronic gastrointestinal symptoms

Age	GERD	UD	IBS
18-29	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)
30-39	0.48 (0.13-1.82)	2.12 (1.19-3.77)	1.15 (0.44-3.04)
40-49	1.14 (0.44-3.00)	1.39 (0.77-2.50)	0.56 (0.18-1.68)
50-59	1.23 (0.46-3.33)	2.28 (1.30-4.02)	0.68 (0.22-2.04)
60-69	3.30 (1.44-7.54)	3.00 (1.75 -5.14)	0.50 (0.15-1.63)

Values are shown as odds ratio and 95% confidence interval. GERD, gastroesophageal reflux disease; UD, uninvestigated dyspepsia; IBS, irritable bowel syndrome.

Table 4 Details of physician visits and use of medications *n* (%)

Variables	Men (n = 762)	Women (n = 655)	Total (n = 1417)
Experience (%) of any GI symptoms	366 (48.0)	351 (53.6)[a]	50.50
Experience (%) of visiting a physician due to GI symptoms	80 (10.5)	75 (11.5)	155 (10.9)
1-2/yr	42 (5.5)	47 (7.2)	89 (6.3)
3-5/yr	12 (1.6)	12 (1.8)	24 (1.7)
6-10/yr	8 (1.0)	4 (0.6)	12 (0.8)
> 10/yr	18 (2.4)	12 (1.8)	30 (2.1)
Use of medications			
NSAIDs	27 (3.5)	54 (8.2)[b]	81 (5.7)
Antacids	35 (4.6)	28 (4.3)	63 (4.5)
H₂RA	11 (1.4)	4 (0.6)	15 (1.1)
Medications for constipation	17 (2.2)	49 (7.5)[b]	66 (4.7)
Antihypertensive medications	17 (2.2)	18 (2.7)	35 (2.5)

[a]$P < 0.05$, [b]$P < 0.01$ compared to male.

cian visits were statistically different ($P < 0.001$). The mean age of subjects with chronic GI symptoms and subjects without chronic GI symptoms was 47.8 ± 14.9 and 43.0 ± 14.6, respectively. Subjects with chronic GI symptoms had a lower education level, and also visited a physician more frequently for gastrointestinal symptoms than subjects without chronic GI symptoms. SF-36 sub-scale scores were calculated for four groups: (1) subjects without chronic gastrointestinal symptoms, (2) subjects with GERD, (3) subjects with uninvestigated dyspepsia, and (4) subjects with IBS. The adjusted mean scores for gender, age, education and economic level, as well as the accompanying *P*-values for the eight domains of the SF-36 are summarized in Table 5. Compared with those not experiencing chronic gastrointestinal symptom, subjects with GERD exhibited significantly worse scores on all except two domains (social-functioning and role-emotional). Subjects with uninvestigated dyspepsia and IBS had significantly worse scores on all domains compared with those not having chronic gastrointestinal symptoms (Table 5). Multiple regression analysis of the association between the HRQOL and covariates was performed on subjects with chronic GI symptoms ($n = 198$) (Table 6). All covariates shows VIF smaller than 10, thus no covariates were excluded as the cause of multi-

Table 5 Comparison of SF-36 subscales between subjects without chronic GI symptoms, and those with GERD, UD and IBS

SF-36 Subscale	Subjects without CGIS (n = 1153)	GERD (n = 50)	UD (n = 166)	IBS (n = 31)
Physical functioning	87.6 ± 5.1	76.0 ± 6.2[b]	81.7 ± 5.4[b]	82.0 ± 66.8[a]
Role physical	80.1 ± 10.3	64.9 ± 12.4[b]	68.1 ± 10.9[b]	67.3 ± 13.7[a]
Bodily pain	89.3 ± 6.7	74.6 ± 8.1[b]	76.5 ± 7.1[b]	77.7 ± 8.9[b]
General health	68.8 ± 7.0	49.3 ± 8.5[b]	52.7 ± 7.5[b]	50.0 ± 9.4[b]
Vitality	57.6 ± 7.5	50.0 ± 9.0[a]	51.0 ± 7.9[b]	45.9 ± 10.0[b]
Social functioning	92.0 ± 4.9	88.3 ± 5.9	86.2 ± 5.2[b]	86.7 ± 6.6[a]
Role emotional	86.2 ± 10.4	80.7 ± 12.5	77.7 ± 11.0[b]	71.7 ± 13.8[b]
Mental health	77.7 ± 6.2	67.9 ± 7.5[b]	71.6 ± 6.6[b]	66.1 ± 8.3[b]

Note: Age, gender, education level and economic level adjusted mean and 95% confidence interval of SF-36 subscale. CGIS: Chronic GI symptom; GERD: Gastroesophageal reflux disease; UD: Uninvestigated dyspepsia; IBS: Irritable bowel syndrome. Comparisons were performed between GERD vs no CGIS, dyspepsia vs no CGIS, and IBS vs no CGIS. P value was adjusted by Bonferroni method. [a]$P < 0.05$ compared to subjects without chronic gastrointestinal symptom; [b]$P < 0.01$ compared to subjects without chronic gastrointestinal symptom.

Table 6 Multiple regression results: estimated coefficient of predictors of each SF-36 subscale domain

Variable	PF	RP	BP	GH	VT	SF	RE	MH
Female sex	-4.6	-9.6	-4.7	-5.3[b]	-4.3[a]	-3.6	-8.2	-1.8
Age[1]	-5.7[c]	-3.2	-1.3	-4.6[b]	-3.2[a]	-1.4	-1.2	-3.5[b]
Ever smoking	2.5	3	2	-2.6	2.3	2.4	3	1.3
Religion	4.1	9.7	-0.1	1.3	6.5[a]	-3.5	-3.5	2.3
< high school education	-6.7[a]	-5.8	-3	2.6	3.1	0.4	3.8	4.2
Low economic class	-2.8	-14.0[a]	-5.8	-3.3	-0.2	-3.9	-17.3	-0.2
Number of physician visit[2]	0.6	-4.8[a]	-4.8[c]	-4.1[b]	-1.9	-0.9	-4.8[a]	-3.5[c]
Presence of overlapping symptoms	-4.7	-3.5	-8.3[a]	-6.9	1.6	-3.9	-5.5	-8.3[b]
R^2	0.375	0.134	0.165	0.19	0.09	0.09	0.124	0.177

PF: Physical function; RP: Role-physical; BP: Bodily pain; GH: General health; VT: Vitality; SF: Social function; RE: Role-emotion; MH: Mental health. [1]Age variables are categorized by 10 yr intervals; [2]Number of physician visits for gastrointestinal symptoms: 0/yr(0), 1-2/yr(1), 3-5/yr(2), 6-10/yr(3), > 10/yr(4). [a]$P < 0.05$; [b]$P < 0.01$; [c]$P < 0.001$.

collinearity. The results of overall F-test were significant for all models ($P < 0.05$). Female gender, old age, a low level of education (< high school education), a low economic class, number of physician visits within the past year, and overlapping chronic gastrointestinal symptoms were associated with reduction in the SF-36 scales.

DISCUSSION

The present population-based study describes the prevalence of chronic gastrointestinal symptoms and their impact on the HRQOL in the Korean population.

Heartburn and acid regurgitation are specific symptoms of GERD, and a diagnosis of GERD can be made on the basis of these symptoms alone without further diagnostic tests[7]. When defined as "at least weekly heartburn and/or acid regurgitation", the prevalence of GERD in the West ranges between 10% and 20%, whereas in Asia the prevalence is reported to be < 5%[8]. In the present study, the prevalence of GERD was found to be 3.5% which is much lower than that in Western countries. According to two previous population studies in Korea, the prevalence of GERD was 5% and 7.1%, respectively[9,10]. It is unclear why the prevalence of GERD is lower in Korea compared to the West. Differences in the intake of dietary fat, body build, genetic factors, and the prevalence of H pylori infection are possible contributing factors[11]. The prevalence of dyspepsia has been shown to vary considerably between different populations. Although our data may represent the presence of valid epidemiological differences, it is also possible that the varying definitions used in different population-based studies may have contributed to this discrepancy. In the present study, the prevalence of uninvestigated dyspepsia by Rome II criteria was 11.7%. These results

are similar to a study from Taiwan, which reported prevalence of functional dyspepsia (FD) by the Rome II criteria as 11.8%[12]. Population-based studies in Australia and Mexico have reported prevalence rates of dyspepsia by Rome II criteria of 24.4%[13] and 8.0%[14], respectively. Based on Rome II criteria, a patient presenting with upper abdominal pain or discomfort that is exclusively relieved by defecation and/or is associated with a change in the bowel pattern is defined as IBS rather than dyspepsia plus IBS[15]. Accordingly, many of the previously Rome I-defined dyspepsia subjects should be reclassified as IBS, rather than IBS with dyspepsia. Furthermore, patients with predominant heartburn should be excluded. Although, the present study could not demonstrate the prevalence of dyspepsia defined by Rome I criteria, the prevalence of dyspepsia by Rome II criteria was lower compared to our previous study using the Rome I criteria (11.7% vs 15.5%)[9]. Reduction in prevalence has also been reported in other studies that directly compared the prevalence of dyspepsia using Rome I and Rome II criteria[12,13,16]. Several individuals who did not meet Rome II criteria for dyspepsia were taking medications such as antacids, prokinetic agents and digestives for a long time. If medication alone was indicative of dyspepsia, our study indicates that its prevalence would be 16%. It is also possible that some subjects had GERD and not dyspepsia, or there was an overlap. One of these factors may also account for the low prevalence of GERD in the Korean population. Over-the-counter medications may explain the underestimation of the prevalence of other functional GI disorders. Conversely, a number of drugs can theoretically induce bowel symptoms. However, data supporting the role of drugs, aside from NSAIDs, in the development of bowel symptoms in the general population are lacking[17,18].

The prevalence of IBS in Asian population-based studies has generally been lower compared to in the

West, regardless of the criteria applied. The prevalence of IBS by Rome II criteria has been reported to vary from 4.7% to 25% in the West and from 3.7% to 19.1% in Asia[19]. In the present study, the prevalence of IBS by Rome II criteria was 2.2%. In addition, the overall prevalence of IBS was similar among men and women; however, the prevalence of constipation-predominant IBS was higher in women. There is typically a significant female predominance with respect to hospital visits by IBS patients in Western countries, but this trend is not consistent with community studies and has been attributed to gender differences in health care utilization[19]. In a recent systematic review of 13 studies on IBS, based on Rome II criteria, 7 studies found a higher prevalence of IBS in females and 4 studies found no gender difference, as in the present study[19]. A possible explanation for the lower female to male ratio in IBS in Koreans may be that men encounter more socioeconomic problems, causing increased stress and, as a consequence, an increased level of IBS[20].

In the present study, we also examined the impact of GERD, and two common chronic gastrointestinal symptoms (uninvestigated dyspepsia and IBS) on the HRQOL. Although a number of studies suggest that the HRQOL is significantly reduced in patients with chronic gastrointestinal symptoms in a referral setting, the data are conflicting[21], and very few studies have evaluated the impact of chronic gastrointestinal symptoms on HRQOL in the general population. In the present study, we observed that the quality of life was significantly impaired in subjects with GERD, uninvestigated dyspepsia and IBS. These findings are consistent with previous studies[5,22-24].

The present study showed that old age, female gender, the number of physician visits per year and presence of overlapping symptoms were associated with a negative impact on several domains of the SF-36. In general, old age was associated with a less favorable assessment of their personal health, pessimistic health appraisal, social isolation and unemployment[25]. Few studies have investigated whether women and men with chronic gastrointestinal symptoms differ with respect to the HRQOL measures. In a study based on referral center and primary care patients, Simren *et al*[26] observed that women with IBS had lower HRQOL compared to men with IBS. In another study, Lee *et al*[27] also found that women with IBS reported lower HRQOL scores. In the present study, a greater number of hospital visits was associated with a poorer HRQOL, which is in agreement with a US population-based study[28]. Fifty five percents of subjects with IBS had sought health care in the past year, and subjects with IBS had significantly lower IBS-QOL scores in the mental health and social functioning domains[28].

The strengths of the present study were inclusion of a random population sample, and the use of personal interviews with the subjects. As a result, we obtained a high response rate (78.4%), avoided a significant response bias, and had a negligible number of missing values. Since the interviewers associated with this study were trained before the commencement of contact with the subjects, a uniform survey was possible due to the fact that the interviewers could explain each aspect of the questionnaire fully, especially to subjects who were old, had low education level, or those who could not understand certain items. Sociodemographic factors including age, gender, educational background and economic level of the individuals in Asan-si were similar to the Korean population, based on the information obtained from the Korean National Statistical Office. Asan-si is a combined urban and farming community. We selected 10 out of the 17 districts of Asan-si. Five districts were randomly chosen in urban areas and the remaining five were selected in rural areas, which may have limited the generalization of the study. However, no differences were found between the demographic factors and the prevalence of GI symptoms in the 10 districts, and between rural and urban areas.

In summary, we evaluated the prevalence of chronic gastrointestinal symptoms in the Korean general population and demonstrated a significant impact of chronic gastrointestinal symptoms on the HRQOL. Dyspepsia was found to be the most common chronic gastrointestinal symptom, and the prevalence of GERD and IBS was lower compared to in the West. The presence of chronic gastrointestinal symptoms was found to have a negative impact on the HRQOL. This negative impact was greater in females, the elderly, individuals of lower economic class, and in subjects with higher number of physician visits, and overlapping symptoms.

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