



CLINICAL RESEARCH

Gastrointestinal symptoms in a Japanese population: A health diary study

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CONCLUSION: Gastrointestinal symptoms are common in the Japanese population, with an incidence of 25%. Abdominal pain, diarrhea, nausea, constipation and dyspepsia are the most frequent symptoms. Risk factors for developing these symptoms include female gender, younger age, and low baseline quality of life.

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Key words: Gastrointestinal diseases; Abdominal Pain; Diarrhea; Nausea; Constipation; Dyspepsia

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Abstract

AIM: To investigate the incidence of gastrointestinal symptoms and the nature of consequent utilization of health care services in a Japanese population.

METHODS: Using self-report, we conducted a prospective cohort study of a nationally representative sample of the Japanese population over a one-month period to determine the incidence of gastrointestinal symptoms of all kinds and resultant health care utilization. Both information on visits to physicians and use of complementary and alternative medicine therapies were collected.

RESULTS: From a total of 3568 in the recruitment sample, 3477 participants completed a health diary (response rate 97%). The data of 112 participants with baseline active gastrointestinal diseases were excluded from the analysis, leaving 3365 participants in the study. The incidence of gastrointestinal symptoms was 25% and the mean number of symptomatic episodes was 0.66 in a month. Abdominal pain, diarrhea, nausea, constipation and dyspepsia were the most frequent symptoms. Female gender, younger age, and low baseline quality of life were risk factors for developing these symptoms. The participants were more likely to treat themselves, using dietary, complementary or alternative medicines, than to visit physicians, except in the case of vomiting.

INTRODUCTION

Although the prevalence of gastrointestinal disease in the Japanese population is known to be high, its epidemiology, incidence, and the consequent utilization of health care services are not well described^[1-3]. An accurate analysis of the incidence of the various symptoms and of the health care services utilized in relation to them would clarify the public health consequences of gastrointestinal symptoms and assist in the setting of priorities in the allocation of health care services and future research funding. There is also little information on the use of complementary and alternative medicine as compared with conventional medicine in the treatment of the various symptoms of gastrointestinal disease. This prospective cohort study was designed to ascertain the incidence of gastrointestinal symptoms in the Japanese general population and to document the subsequent use of health care, as recorded by the participants in a health diary.

MATERIALS AND METHODS

Participants

This analysis of the incidence of gastrointestinal symptoms and subsequent health care practices in Japan is drawn from a prospective cohort study, using participants' health diaries established for the ecological analysis of

medical care in Japanese communities^[4]. A population-weighted random sample of households was selected by controlling for the size of cities, towns and villages. Participants who had baseline active gastrointestinal diseases were excluded from the analysis. Because of the national policy of universal health insurance coverage in Japan, all households sampled were covered by health insurance. Prior ethical approval from the Research Ethics Committee of Kyoto University Graduate School of Medicine was obtained.

There are advantages to using health diaries when investigating individual health and related behavior^[4-8]. Health diaries can provide an immediate and continuous record of daily health events and behaviors, and minimize recall bias^[4], without the intervention of direct observational measures^[7,9]. The methodology of this health diary study is described in detail elsewhere^[4].

Data collection

For the purposes of the study, the independent variables were baseline demographic and clinical data. The dependent variables were self-reported gastrointestinal symptoms, which were categorized and coded based on the ICPC-2 (International Classification of Primary Care second edition). They included diffuse abdominal pain, upper abdominal pain, diarrhea, nausea, constipation, dyspepsia, vomiting, abdominal fullness, heartburn, lower abdominal pain, hematemesis, and hematochezia.

The health diary procedure required the keeping of a daily record for one month, from October 1 to October 31, 2003, of all health-related events, including gastrointestinal symptoms, health care accessed, and anything else of relevance. The health diary format specifically sought responses to the following questions: (1) Did you have any pain or other health symptoms that caused you discomfort? (2) If so, what kind of symptoms did you have? (3) If the answer to the first question was yes, did you consult a physician? Did you use dietary supplements such as nutritional drinks, vitamins, and calcium? Did you undergo any physical remedy, such as acupressure, acupuncture, or massage? Subjects younger than 15 years old were also included in this study. The parents of these children were requested to ask the questionnaires and record them accordingly. We did not include the use of over-the-counter-medications as utilizations of health care services in this study.

Data was extracted on the number of days in which symptom-related visits to a physician occurred during the study period, whether to a primary care physician, a community hospital, a university hospital, or an emergency department. Data was also collected on the number of days complementary and alternative medicines were used, whether dietary supplements or physical remedies. The use of complementary and alternative medicine was divided into two categories: (1) Dietary complementary and alternative medicine, such as nutritional drinks, herbs, kampo, supplements, vitamins, minerals, and other dietary substances; (2) Physical complementary and alternative medicine, such as massage, acupuncture, acupressure, Judo-seifuku, moxibustion, chiropractic, and similar physical manipulations.

Baseline data, including demographic, health-related, and socioeconomic information, was also collected. The SF-8 instrument was used to measure baseline health-related quality of life. The SF-8 generates a health profile consisting of eight scales and two summary measures: a physical component summary (PCS8) and a mental component summary (MCS8)^[10]. The SF-8 is scored by assigning the mean SF-36 scale score for the Japanese population as measured in 2002 to each response category of the SF-8 measuring the same concept. A higher or lower individual score indicates a better or worse health status than the mean, respectively^[11]. We also included the baseline number for comorbidity as a covariate. The number of co-morbidities was calculated by counting the number of diseases present with no weights^[12].

Data on a number of characteristics was collected as socioeconomic baseline measurements. Annual household income was divided into 6 categories. Employment status was recorded as one of 6 categories: student, homemaker, jobless or not able to work, retiree, part-time employee, and full-time employee or self-employed worker. Self-reported educational attainment was also classified at 6 levels: junior high school or below, high school graduate, vocational college, 1-2 years college, college degree, graduate school degree or higher.

Statistical analysis

The incidence (proportions) and the number of episodes (days with the symptom) of individual gastrointestinal symptoms were calculated during the one-month study period. Multivariable adjusted Poisson regression models were constructed to obtain adjusted rate ratios for the number of episodes of the various gastrointestinal symptoms in relation to baseline demographic and clinical factors. Health care utilization for one month of participants who developed gastrointestinal symptoms was also calculated. A two-tailed *P*-value of 0.05 was regarded as statistically significant. The STATA software version 8.2 (College Station, Texas, USA) was used for all statistical analyses.

RESULTS

From a total of 3568 in the study recruitment sample, 3477 participants completed the diary (97.4%). Of these, 112 with baseline active gastrointestinal diseases were excluded and the remaining 3365 participants were enrolled in the study (Table 1). 1573 (46%) were men. The mean age was 34 years (range 0-96 years). 17% of the 3365 participants lived in large cities, 24% in medium-sized cities, 38% in small cities, and 21% in rural areas. Table 1 shows the demographic, socioeconomic and clinical characteristics of the participants in two groups: those who developed any gastrointestinal symptom and those who recorded none. A univariate analysis showed no significant differences in socioeconomic characteristics between the two groups. A trend test yielded *P* = 0.212 for annual household income, *P* = 0.143 for occupational status, and *P* = 0.719 for educational attainment. Chi-square tests showed significant differences between the two groups on the variables of gender (*P* < 0.001), past history of gastrointestinal disease

Table 1 Demographic, socioeconomic and clinical characteristics of the participants

Variable	All participants (<i>n</i> = 3365)		Developed GI symptoms (<i>n</i> = 856)		No GI symptoms (<i>n</i> = 2509)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Demographics						
Gender						
Male	1573	45.7	328	38.3	1245	49.6
Female	1792	53.3	528	61.7	1264	50.4
Age (yr)						
0-9	651	19.3	155	18.1	496	19.8
10-19	431	12.8	104	12.1	327	13.0
20-29	416	12.4	133	15.5	283	11.3
30-39	476	14.1	139	16.2	337	13.4
40-49	490	14.6	134	15.7	356	14.2
50-59	345	10.3	76	8.9	269	10.7
60-69	331	9.8	61	7.1	270	10.8
70-79	188	5.6	45	5.3	143	5.7
≥ 80	37	1.1	9	1.1	28	1.1
Socioeconomic characteristics						
Annual household income						
< 3 000 000 Japanese yen	424	12.6	112	13.1	312	12.4
3 000 000 to < 5 000 000	652	19.4	189	22.1	463	18.5
5 000 000 to < 7 000 000	522	15.5	127	14.8	395	15.7
7 000 000 to < 10 000 000	426	12.7	111	13.0	315	12.6
10 000 000 to < 12 000 000	167	5.0	42	4.9	125	5.0
≥ 12 000 000	82	2.4	16	1.9	66	2.6
N/A	1092	32.5	259	30.3	833	33.2
Employment status						
Full-time employee/self-employed	1086	32.3	274	32.0	812	32.4
Part-time employee	374	11.1	100	11.7	274	10.9
Retiree	129	3.8	26	3.0	103	4.1
Jobless or unable to work	91	2.7	24	2.8	67	2.7
Homemaker	490	14.6	153	17.9	337	13.4
Student	89	2.6	18	2.1	71	2.8
N/A	1106	32.9	261	30.5	845	33.7
Educational attainment						
Junior high school or lower	84	2.5	16	1.9	68	2.7
High school graduate	471	14.0	122	14.3	349	13.9
Vocational college	135	4.0	38	4.4	97	3.9
1-3 yr of college	156	4.6	50	5.8	106	4.2
College degree	336	10.0	85	9.9	251	10.0
Graduate school degree	23	0.7	8	0.9	15	0.6
N/A	2160	64.2	537	62.7	1623	64.7
Baseline clinical characteristics						
Previous GI diseases						
Yes	326	9.7	117	13.7	209	8.3
No	2956	87.8	722	84.3	2234	89.0
N/A	83	2.5	17	2.0	66	2.6
No. of comorbidities						
None	2548	75.7	646	75.5	1902	75.8
One	578	17.2	157	18.3	421	16.8
Two or more	239	7.1	53	6.2	186	7.4
PCS8 score						
≥ 50	1930	57.4	458	53.5	1472	58.7
< 50	1304	38.8	363	42.4	941	37.5
N/A	131	3.9	35	4.1	96	3.8
MCS8 score						
≥ 50	1704	50.6	368	43.0	1336	53.2
< 50	1530	45.5	453	52.9	1077	42.9
N/A	131	3.9	35	4.1	96	3.8

N/A: indicates data not available; GI: gastrointestinal; PCS8: physical component of SF8; MCS8: mental component of SF8.

Table 2 Incidence and the number of episodes of gastrointestinal symptoms (*n* = 3365)

Symptom	Incidence per month		Episodes in a month	
	<i>n</i>	(% of total)	mean	SD
Any gastrointestinal symptoms	856	(25.44)	0.656	1.794
Diffuse abdominal pain	401	(11.92)	0.214	0.799
Upper abdominal pain	179	(5.32)	0.114	0.801
Diarrhea	169	(5.02)	0.095	0.651
Nausea	148	(4.40)	0.067	0.393
Constipation	70	(2.08)	0.064	0.689
Dyspepsia	86	(2.56)	0.051	0.423
Vomiting	44	(1.31)	0.016	0.164
Abdominal fullness	34	(1.01)	0.015	0.187
Heartburn	18	(0.53)	0.010	0.173
Lower abdominal pain	16	(0.48)	0.009	0.158
Hematemesis	1	(0.03)	0.000	0.017

SD: standard deviation. There were no participants with hematochezia.

($P < 0.001$), MCS8 ($P < 0.001$), and PCS8 ($P = 0.008$).

Table 2 shows the incidence per month for 3365 participants and the number of episodes of gastrointestinal symptoms of these participants during the one month study period. 856 (25%) developed one or more gastrointestinal symptoms. The symptoms of high incidence ($\geq 1\%$) were diffuse abdominal pain (12%), upper abdominal pain (5%), diarrhea (5%), nausea (4%), dyspepsia (3%), constipation (2%), vomiting (1%), and abdominal fullness (1%). The mean number of episodes of gastrointestinal symptoms of any kind was 0.66 in the one-month period. The symptoms with a high number of episodes were diffuse abdominal pain (0.21), upper abdominal pain (0.11), diarrhea (0.10), nausea (0.07), constipation (0.06), dyspepsia (0.05), vomiting (0.02), and abdominal fullness (0.01).

Table 3 shows rate ratios based on multivariable adjusted Poisson regression analyses. Age and the number of comorbidity are treated as continuous variables in this Table. Gastrointestinal symptoms were reported more commonly by women than men. Symptoms with a significantly higher number of episodes in women were diffuse abdominal pain, upper abdominal pain, nausea, and constipation, and symptoms with a significantly higher number of episodes in men were diarrhea and heartburn.

Gastrointestinal symptoms were reported more often in younger than in older age groups. Symptoms associated with older age were upper abdominal pain, dyspepsia, constipation, abdominal fullness, and heartburn, while symptoms associated with younger age were diffuse abdominal pain, diarrhea, nausea, and vomiting. The symptoms that featured in comorbidity were nausea and constipation.

Gastrointestinal symptoms were reported more often by participants with poor baseline quality of life scores. Diffuse abdominal pain, diarrhea and dyspepsia were symptoms associated with a poor baseline score on the physical component of the health-related quality of life test. Symptoms associated with a poor baseline score on the mental component of the health-related quality of life test were diffuse abdominal pain, upper abdominal pain,

nausea, constipation, and abdominal fullness.

Table 4 shows the health care utilization characteristics of participants with one or more gastrointestinal symptoms in the survey month. Overall, use of dietary complementary and alternative medicine was more frequent than visiting a physician (Bonferroni pair-wise comparison, $P < 0.001$), but visiting a physician was more frequent than use of physical forms of complementary and alternative medicine (Bonferroni pair-wise comparison, $P < 0.001$). However, visiting a physician was more frequent than use of dietary complementary and alternative medicine in those whose symptom was vomiting. Among those with dyspepsia and heartburn, use of both dietary and physical complementary and alternative medicine was more frequent than visiting a physician.

DISCUSSION

Our results indicate that gastrointestinal symptoms are of common occurrence in the Japanese general population, with about a quarter developing a gastrointestinal symptom of some kind in a month. Abdominal pain, diarrhea, nausea, constipation and dyspepsia were the most frequent gastrointestinal symptoms in our sample. Risks for developing these symptoms differ in relation to the baseline factors of gender, age, and quality of life. Japanese who develop gastrointestinal symptoms are more likely to treat themselves with dietary forms of complementary and alternative medicine than to visit physicians, except in the case of vomiting.

Gastrointestinal symptoms with a high incidence were, in order, diffuse and upper abdominal pain, diarrhea, nausea, constipation, and dyspepsia. These findings are consistent with those of one previous study^[2], while another found that diarrhea was more common than abdominal pain^[3]. It may be that self-reporting of diarrhea underestimates its actual incidence^[13]. A study that asks about diarrhea and loose stools separately obtains a lower incidence of diarrhea than one in which participants include loose stool in their definition of diarrhea^[3]. Thus differences in participants' definitions could account for differences in the estimated incidence of diarrhea between previous studies^[14].

Our study found that women were more likely to develop diffuse and upper abdominal pain, nausea, and constipation than men. Previous studies suggest that the incidence of many gastrointestinal symptoms is higher in women than in men^[1,3,15-18], and many studies indicate that abdominal pain, specifically, is more common in women^[1,3,15-18], although two studies have shown no gender difference^[19,20]. Abdominal fullness, also, is more common in women than in men^[21]. A higher prevalence of occult irritable bowel syndrome in women could account for the higher incidence and prevalence of such symptoms as abdominal pain, nausea, and constipation^[3,22]. Alternatively, a higher sensitivity in the perception of such symptoms in women could also contribute to the difference^[3].

Our study found that men were more likely to develop diarrhea and heartburn than women. This finding differs from a number of studies indicating no gender difference for diarrhea^[3,16,18], while a recent international study found

Table 3 Rate ratios based on multivariable adjusted poisson regression analyses

Variable symptom	Female gender	Older age	Previous GI disease	No. of comorbidity	Better PCS8	Better MCS8
Any gastrointestinal symptoms	1.412 (< 0.01)	0.994 (< 0.01)	1.894 (< 0.01)	1.055 NS	0.738 (< 0.01)	0.645 (< 0.01)
Diffuse abdominal pain	1.455 (< 0.01)	0.980 (< 0.01)	1.385 (< 0.01)	0.886 NS	0.545 (< 0.01)	0.548 (< 0.01)
Upper abdominal pain	1.485 (< 0.01)	1.016 (< 0.01)	2.504 (< 0.01)	0.855 (< 0.05)	0.975 NS	0.426 (< 0.01)
Diarrhea	0.765 (< 0.05)	0.972 (< 0.01)	1.485 (< 0.05)	0.981 NS	0.636 (< 0.01)	0.986 NS
Nausea	2.828 (< 0.01)	0.983 (< 0.01)	2.364 (< 0.01)	1.259 (< 0.01)	1.032 NS	0.575 (< 0.01)
Dyspepsia	1.171 NS	1.033 (< 0.01)	4.035 (< 0.01)	0.888 NS	0.462 (< 0.01)	1.068 NS
Constipation	2.877 (< 0.01)	1.014 (< 0.01)	1.198 NS	1.427 (< 0.01)	1.234 NS	0.364 (< 0.01)
Vomiting	0.847 NS	0.940 (< 0.01)	1.617 NS	1.141 NS	0.903 NS	1.421 NS
Abdominal fullness	1.833 NS	1.020 (< 0.05)	1.871 NS	0.936 NS	1.305 NS	0.476 (< 0.05)
Heartburn	0.286 (< 0.01)	1.053 (< 0.01)	2.653 (< 0.05)	1.027 NS	1.324 NS	1.227 NS
Lower abdominal pain	1.555 NS	1.005 NS	0.844 NS	1.023 NS	0.699 NS	0.515 NS

GI: gastrointestinal; PCS8: physical component of SF8; MCS8: mental component of SF8. Adjusted for all covariates shown above. The numbers of parentheses indicate statistically significant *P*-values. Age and No. of comorbidity were treated as continuous variables. PCS8 and MCS8 were treated as binary variables with cutoff point of 50. Hematemesis and hematochezia could not be analyzed because of few incidence.

Table 4 Health care utilization in a month among the participants with gastrointestinal symptoms

Symptom	Visits to a physician		Dietary CAM uses		Physical CAM uses	
	mean (d)	SD	mean (d)	SD	mean (d)	SD
Any gastrointestinal symptoms	0.67	1.502	1.82	5.614	0.12	0.891
Diffuse abdominal pain	0.58	1.518	1.48	5.075	0.10	1.133
Upper abdominal pain	0.45	1.040	2.76	6.823	0.32	1.791
Diarrhea	0.81	1.300	1.39	4.747	0.07	0.431
Nausea	0.76	1.274	1.70	4.738	0.25	1.851
Dyspepsia	0.50	1.344	4.47	8.023	0.52	2.533
Constipation	0.90	1.746	2.43	6.333	0.20	0.651
Vomiting	1.64	2.354	0.89	2.442	0.00	0.00
Abdominal fullness	0.32	0.638	2.91	6.440	0.06	0.343
Heartburn	0.44	0.784	2.11	3.692	0.50	1.465
Lower abdominal pain	0.63	1.628	2.06	7.206	0.19	0.750
Hematemesis	0.00	0.000	0.00	0.000	0.00	0.000

CAM: complementary and alternative medicine; SD: standard deviation. Hematochezia could not be analyzed because of few incidence.

that the incidence of diarrhea was higher in women in a number of countries, including Australia, Canada, Ireland, and the United States^[23]. Gastroesophageal reflux disease symptoms, such as heartburn and acid regurgitation, showed no gender difference in an earlier Japanese study^[24], and studies in Sweden and Belgium also found no gender difference in the prevalence of heartburn^[1,25]. These conflicting results suggest the need for further investigation.

Overall, gastrointestinal symptoms were reported more commonly in younger than in older participants in the

current study. Previous studies have shown a significantly higher prevalence of abdominal symptoms in young women, which decreases with age^[1,3,26]. Nevertheless the current study found that older individuals are more likely to suffer upper abdominal pain, dyspepsia, constipation, abdominal fullness, and heartburn than the young. The young are more likely to report diffuse abdominal pain, diarrhea, nausea, and vomiting than the old. This difference between the old and the young in the incidence of many gastrointestinal symptoms may derive from an age-associated change in visceral sensitivity^[3], but the

source of the difference has not yet been established.

Our study found that those with a poor baseline score on the physical component of quality of life had a higher likelihood than those with an average score of developing diffuse abdominal pain, diarrhea and dyspepsia, while those with a poor baseline score on the mental component of quality of life were more likely than those with an average score to report diffuse and upper abdominal pain, nausea, constipation, and abdominal fullness. To our knowledge, this study is the first prospective cohort study to analyze baseline quality of life scores as predictors of gastrointestinal symptoms. A possible higher prevalence of occult irritable bowel syndrome in those with a poor score on the mental component of the quality of life measure may explain their higher incidence and prevalence of such symptoms as abdominal pain, nausea, constipation, and abdominal fullness^[3,22]. This finding requires further study for confirmation.

The current study may be the first prospective cohort study to describe health care utilization in individuals in response to gastrointestinal symptoms. Our results indicate that self-treatment with dietary complementary and alternative medicine is more frequent than visiting a physician regarding all symptoms except vomiting. Recourse to physical as well as dietary complementary and alternative therapies was more frequent than visiting a physician in the case of dyspepsia and heartburn.

Complementary and alternative therapies, some of which had their origins in Japan, are increasingly used by the general population in industrialized countries^[27-29]. This is true of a substantial proportion of the Japanese population, who use them frequently at a high cost to personal income^[30]. Patients with functional and general gastrointestinal disorders are likely to turn to complementary and alternative medicine when conventional therapies fail to relieve their symptoms^[31]. Therefore physicians need to keep their knowledge up to date on the regulations, side effects, and possible benefits of specific herbal products used by patients^[32]. Studies of the effectiveness of complementary and alternative therapies for functional gastrointestinal disorders have, however, often been limited by study designs^[33].

It should be borne in mind that the health diaries in this study were self-reports and therefore subjective. A further limitation is that information on the severity of symptoms was not requested. As symptoms were not classified as less or more severe, there was no means of determining whether severity differentially influenced decisions to note them in the diaries or to seek different forms of treatment. This may have resulted in misclassification biases^[14].

In summary, gastrointestinal symptoms are of common occurrence in the Japanese population. Overall, the mean number of episodes of gastrointestinal symptoms was 0.66 in a month. About a quarter of respondents developed at least one gastrointestinal symptom in the course of the month. Abdominal pain, diarrhea, nausea, constipation and dyspepsia were the most frequent gastrointestinal symptoms. Female gender, younger age, and low baseline quality of life are risk factors for developing gastrointestinal symptoms. Japanese with gastrointestinal symptoms other than vomiting are more likely to resort to

dietary forms of complementary and alternative medicine than to visit physicians.

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COMMENTS

Background

The incidence of gastrointestinal symptoms and the nature of consequent utilization of health care services in the Japanese population are not well documented. Our aim was to provide better description in this epidemiology of gastrointestinal symptoms.

Research frontiers

The prevalence of gastrointestinal disease in the Japanese population is known to be high. However, its epidemiology, its incidence, and the consequent utilization of health care services are not well described. There is also little information on the use of complementary and alternative medicine as compared with conventional medicine in the treatment of the various symptoms of gastrointestinal disease.

Innovations and breakthroughs

In this study of Japan, the incidence of gastrointestinal symptoms was 25% and the mean number of the symptomatic episodes was 0.66 in a month. Abdominal pain, diarrhea, nausea, constipation and dyspepsia were the most frequent symptoms. Female gender, younger age, and low baseline quality of life were risk factors for developing these symptoms. The participants were more likely to treat themselves, using dietary complementary or alternative medicines, than to visit physicians, except in the case of vomiting.

Applications

Gastrointestinal symptoms are very common in the Japanese general population. The most frequent symptoms include abdominal pain, diarrhea, nausea, constipation and dyspepsia. Risk factors for developing these symptoms are female gender, younger age, and low baseline quality of life. These results may help to understand the public health consequences of gastrointestinal symptoms and to assist in the setting of priorities in the allocation of health care services and of future research funding.

Terminology

Health diary: a daily record of daily health events and behaviors. This research methodology can provide an immediate and continuous record of daily health events and behaviors and minimize recall bias without the intervention of direct observational measures.

Peer review

This article documented about epidemiology of gastrointestinal symptom among Japanese. Study period is relatively short. Generally, it is well designed and clarified the incidence of gastrointestinal symptom among Japanese. The study also revealed Japanese actions to gastrointestinal symptoms.

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