ORIGINAL ARTICLE

Korean J Intern Med 2018;33:829-836
https://doi.org/10.3904/kjim.2016.223

Association between dietary intake and postlaparoscopic cholecystectomic symptoms in patients with gallbladder disease

Yongju Shin[1], Dongho Choi[2], Kyeong Geun Lee[2], Ho Soon Choi[3], and Yongsoon Park[1]

[1]Department of Food and Nutrition, Hanyang University College of Human Ecology, Seoul; Departments of [2]Surgery and [3]Internal Medicine, Hanyang University College of Medicine, Seoul, Korea

Received: July 12, 2016
Revised : October 5, 2016
Accepted: October 10, 2016

Correspondence to
Yongsoon Park, Ph.D.
Department of Food and Nutrition, Hanyang University, 222 Wangsimni-ro, Seongdong-gu, Seoul 04763, Korea
Tel: +82-2-2220-1205
Fax: +82-2-2292-1226
E-mail: yongsoon@hanyang.ac.kr

Background/Aims: After cholecystectomy, patients have reported postcholecystectomic syndromes such as abdominal symptoms, dyspepsia, and diarrhea, which suggest a relationship between cholecystectomic symptoms and diet, although the details of this association remain unclear. The present study investigated the hypothesis that dietary intake of nutrients and foods was significantly associated with postcholecystectomic syndromes.

Methods: Gallstone patients (n = 59) who underwent laparoscopic cholecystectomy were enrolled, and dietary intake and clinical parameters were assessed immediately postcholecystectomy and 3 months later.

Results: There were no significant differences in biochemical measurements or characteristics between symptomatic and asymptomatic patients. Immediately postcholecystectomy, there were no significant differences in consumption of nutrients or foods between symptomatic and asymptomatic patients. However, 3 months after cholecystectomy, symptomatic patients consumed more animal protein, cholesterol, and eggs, and fewer vegetables than did asymptomatic patients. Multivariable-adjusted regression analyses also indicated that the risk for symptoms was positively associated with intake of animal protein, cholesterol, and eggs, but negatively associated with intake of vegetables after adjusting for confounders. In addition, symptomatic patients consumed more bread-based breakfast foods, while asymptomatic patients consumed more rice.

Conclusions: Postcholecystectomic syndromes were positively associated with intake of cholesterol, animal protein, and eggs, and negatively associated with intake of vegetables, suggesting that diet was plays a role in postcholecystectomic syndromes.

Keywords: Diet; Gallstone; Postcholecystectomy syndrome; Follow-up studies

INTRODUCTION

Laparoscopic cholecystectomy is an effective treatment for symptomatic cholelithiasis with minimal risk [1]. However, some patients who undergo cholecystectomy report postcholecystectomic syndromes, defined as the recurrence of symptoms similar to those experienced before the cholecystectomy, such as abdominal symptoms, dyspepsia and diarrhea [2].

The absence of the gallbladder after a cholecystectomy was reported to cause rapid enterohepatic recycling, an increase in the secretion and a decrease in the reabsorp-

pISSN 1226-3303
eISSN 2005-6648
http://www.kjim.org

tion of bile acid, and a shortened colonic transit time [3,4]. Some patients who underwent cholecystectomy experienced diarrhea, which could be associated with the malabsorption of bile acid [5]. After cholecystectomy, patients are at an increased risk for duodenogastric reflux, which causes dyspepsia [6,7]. In addition, abdominal pain and irritable bowel syndrome were reported in patients after cholecystectomy; these symptoms could be associated with sphincter of Oddi dysfunction [8,9].

It has been suggested that postcholecystectomic syndromes are related to diet, due to changes in bile acid metabolism [3] and duodenogastric reflux [7]. Taiwanese patients who did not follow instructions to maintain a low-fat diet experienced more diarrhea, both 1 week and 3 months after cholecystectomy [10]. A high-fat diet has been shown to increase fecal bile acid [11], and diarrhea can be caused by the increased passage of bile acids into the colon [12]. In addition, after laparoscopic cholecystectomy, some patients reported troublesome food intolerance, particularly to fatty foods [13,14]. Intolerance to fatty foods appears frequently in patients with dyspepsia, since fatty foods could delay gastric emptying [15,16].

Previous studies have focused only on the relationship between a high-fat diet and postcholecystectomic syndromes [10,13,14], and no other nutrients or foods. Therefore, the present study investigated the hypothesis that dietary intake of nutrients and foods was significantly associated with postcholecystectomic syndromes.

METHODS

Patients

Gallstone patients (n = 59) who underwent laparoscopic cholecystectomy at the general surgery clinic, Hanyang University Seoul Hospital, Seoul, Korea from April 2014 to May 2015 were enrolled in this study. Patients were asked if they had symptoms, such as abdominal pain, dyspepsia, functional constipation, and diarrhea immediately postlaparoscopic cholecystectomy and 3 months later. This study was performed in accordance with the Declaration of Helsinki. All procedures were approved by the Institutional Review Board of Hanyang University (HYI-14-001-2), and written informed consent was obtained from all patients.

Data collection

The following information was obtained from patients by trained interviewers: age, sex, family history of gallstone disease, medical and medication history, previous experience with weight control, exercise, smoking status, and alcohol and supplement consumption. Height, weight, and waist circumference were measured, and body mass index (BMI, kg/m^2) was calculated. Information regarding fatty liver and the diameter of the common bile duct were obtained from medical records and pathology reports. All patients underwent ultrasound at the time of the operation and 3 months later. Ultrasound was performed with an iU22 (Philips Ultrasound, Bothell, WA, USA) or a EUB-7500 (Hitachi, Tokyo, Japan) equipped with a 5-MHz convex transducer.

Biochemical data

Biochemical parameters tests, including white blood count (WBC), hemoglobin (Hb), hematocrit (Hct), and platelet (PLT), were measured by a Sysmex XE-2100 (Sysmex, Kobe, Japan). Total protein (TP), albumin (ALB), fasting blood sugar (FBS), creatinine (Cr), blood urea nitrogen (BUN), aspartate aminotransferase (AST), alkaline phosphatase (ALP), triglyceride (TG), total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), and high density lipoprotein cholesterol (HDL-C) were measured by a Hitachi 7600 automatic analyzer (Hitachi).

Dietary assessment

After laparoscopic cholecystectomy, dietary intake was assessed using a semiquantitative food frequency questionnaire of 63 food items commonly consumed by Korean national health and examination survey [17]. Patients were asked about the frequency of intake for each food during the previous year, on average. Frequency of food intake was classified into 10 categories: 1, 2, or 3 times per day; 4 to 6 times per week; 2 to 3 times per week; once per week; 2 to 3 times per month; once per month; 6 to 11 times per year; and never or seldom. Three months after laparoscopic cholecystectomy, dietary intake was assessed using 24-hour recall, including food description, time of intake, amount of food and location where food was eaten. Dietary intake was analyzed using Can-pro 4.0 (Korean Nutrition Society, Seoul, Korea).

https://doi.org/10.3904/kjim.2016.223

Statistical analysis

Data were expressed as mean ± standard deviation, and a *p* value less than 0.05 was considered statistically significant. All data were analyzed using SPSS version 21.0 (IBM Co., Armonk, NY, USA). Categorical variables were analyzed using the chi-square test, and continuous variables were analyzed using independent *t* tests. Odds ratios and 95% confidence intervals were obtained using multivariable logistic regression analyses in order to determine the associations of daily nutrients and foods intake according to the presence of symptoms after adjusting for energy intake and a medical history of digestive diseases postlaparoscopic cholecystectomy, and energy intake and exercise frequency 3 months after laparoscopic cholecystectomy.

RESULTS

Characteristics of symptomatic and asymptomatic patients

After laparoscopic cholecystectomy, symptomatic patients had a more extensive medical history of digestive disease than did asymptomatic patients (Table 1). Symptomatic patients also exercised less (3 to 4 times per week) than did asymptomatic patients (5 to 6 times per week) 3 months after laparoscopic cholecystectomy. Comparing symptomatic and asymptomatic patients, there were no significant differences in age, sex, BMI, waist circumference, family history of gallstone disease, medications, previous experiences of weight control, smoking, drinking, use of supplements, the presence of fatty liver, or the diameter of the common bile duct (Table 1). At postlaparoscopic cholecystectomy and 3 months after laparoscopic cholecystectomy, blood pa-

Table 1. Characteristics of asymptomatic and symptomatic patients immediately postlaparoscopic cholecystectomy and 3 months after laparoscopic cholecystectomy

Characteristic	Postlaparoscopic cholecystectomy			Three months after laparoscopic cholecystectomy		
	Asymptomatic (n = 24)	Symptomatic (n = 35)	*p* value	Asymptomatic (n = 32)	Symptomatic (n = 27)	*p* value
Age, yr	47.54 ± 12.34	50.31 ± 14.92	0.456	51.03 ± 11.56	47.67 ± 16.17	0.371
Female sex	11 (45.8)	18 (51.4)	0.673	14 (43.8)	15 (55.6)	0.366
Body mass index, kg/m^2	25.73 ± 4.44	25.02 ± 3.04	0.471	25.65 ± 3.46	25.13 ± 3.88	0.585
Waist circumference, cm	92.33 ± 11.70	91.67 ± 11.31	0.828	88.05 ± 9.88	87.56 ± 9.74	0.849
Family history of gallstones	3 (12.5)	6 (17.1)	0.626	2 (6.3)	5 (18.5)	0.147
Medical history of digestive system disease	2 (8.3)	11 (31.4)	0.036	8 (25.0)	8 (29.6)	0.690
Medication	13 (54.2)	20 (57.1)	0.821	15 (46.9)	10 (37.0)	0.446
Dieting for weight control	8 (33.3)	16 (45.7)	0.342	2 (6.3)	3 (11.1)	0.504
Exercise[a]	8 (33.3)	18 (51.4)	0.169	14 (43.8)	16 (59.3)	0.235
1–2 times/wk	4 (50.0)	5 (27.8)		4 (28.6)	5 (31.3)	
3–4 times/wk	2 (25.0)	8 (44.4)	0.502	1 (7.1)	8 (50.0)	0.014
≥ 5–6 times/wk	2 (25.0)	5 (27.8)		9 (64.3)	3 (18.8)	
Smoking	3 (12.5)	3 (8.6)	0.624	4 (12.5)	3 (11.1)	0.869
Drinking	17 (70.8)	21 (60.0)	0.393	18 (56.3)	12 (44.4)	0.366
Fatty liver	14 (58.3)	15 (42.9)	0.243	19 (59.4)	13 (50.0)	0.475
CBD diameter, mm	4.35 ± 1.22	3.90 ± 1.26	0.185	4.91 ± 2.34	4.66 ± 1.95	0.663
Change in CBD diameter, mm	-	-	-	0.95 ± 2.19	0.40 ± 2.48	0.367

Values are presented as mean ± SD or number (%). *p* values were determined by independent *t* test for continuous variables, and the chi-square test for the categorical variables between symptomatic and asymptomatic patients.
CBD, common bile duct.
[a] ≥ 30 Minutes in one session.

rameters, such as WBC, Hb, Hct, PLT, TP, ALB, FBS, Cr, BUN, AST, ALP, TG, TC, HDL-C, and LDL-C were not significantly different between symptomatic and asymptomatic patients (data not shown) (Supplementary

Table 2. Daily intake of nutrients and foods between asymptomatic and symptomatic patients 3 months after laparoscopic cholecystectomy

Variable	Asymptomatic (n = 32)	Symptomatic (n = 27)	*p* value
Energy, kcal	1,716.97 ± 474.02	1,616.83 ± 657.49	0.500
Carbohydrate, g/1,000 kcal	155.07 ± 32.27	146.01 ± 36.22	0.314
Lipid, g/1,000 kcal	25.89 ± 10.84	25.98 ± 9.52	0.974
Protein, g/1,000 kcal	36.71 ± 8.60	42.85 ± 14.21	0.056
Plant protein, g/1,000 kcal	21.30 ± 6.63	19.70 ± 5.13	0.312
Animal protein, g/1,000 kcal	15.41 ± 10.07	23.15 ± 16.00	0.035
Fiber, g/1,000 kcal	14.03 ± 7.27	11.93 ± 4.38	0.194
Cholesterol, mg/1,000 kcal	136.51 ± 112.55	219.39 ± 153.25	0.020
Grain, g	272.28 ± 156.76	237.90 ± 183.00	0.440
Potato, g	36.71 ± 61.25	32.73 ± 66.27	0.812
Vegetable, g	324.12 ± 203.49	212.663 ± 134.13	0.018
Fruit, g	159.20 ± 130.76	221.71 ± 271.71	0.253
Meat, g	63.09 ± 77.03	91.03 ± 119.03	0.300
Egg, g	12.17 ± 19.17	35.91 ± 44.42	0.014
Fish and seafood, g	80.14 ± 132.95	63.82 ± 83.40	0.583
Dairy product, g	65.79 ± 92.73	79.61 ± 117.34	0.615

Values are presented as mean ± SD. *p* values were determined by independent *t* test.

Table 3. Dietary habits between asymptomatic and symptomatic patients 3 months after laparoscopic cholecystectomy

Variable	Asymptomatic (n = 32)	Symptomatic (n = 27)	*p* value
Breakfast consumer	31 (96.9)	23 (85.2)	0.108
Rice	25 (80.6)	12 (52.2)	
Potato	0	2 (8.7)	
Bread	0	5 (21.7)	0.015
Dairy	3 (9.7)	2 (8.7)	
Fruit and vegetable	3 (9.7)	2 (8.7)	
Food preferred	5 (15.6)	7 (25.9)	0.327
Potato	0	1 (14.3)	
Fruit and vegetable	5 (100.0)	5 (71.4)	1.000
Seafood	0	1 (14.3)	
Food avoided	10 (31.3)	16 (59.3)	0.031
Meat	3 (30.0)	4 (25.0)	
Oily food	5 (50.0)	9 (56.3)	
Seafood	0	1 (6.3)	0.388
Alcohol	2 (20.0)	0	
Other	0	2 (12.5)	

Values are presented as number (%). *p* values were determinate by chi-square test for the categorical variables between symptomatic and asymptomatic patients.

https://doi.org/10.3904/kjim.2016.223

Table 1).

Dietary intake of symptomatic and asymptomatic patients

Immediately postlaparoscopic cholecystectomy, there were no significant differences in the consumption of nutrients or foods between symptomatic and asymptomatic patients (data not shown) (Supplementary Tables 2 and 3). However, 3 months after laparoscopic cholecystectomy, symptomatic patients consumed more animal protein, cholesterol, and eggs, and fewer vegetables than did asymptomatic patients (Table 2). There were no significant differences in consumption of vitamins, minerals, or other foods between symptomatic and asymptomatic patients 3 months after laparoscopic cholecystectomy (data not shown) (Supplementary Table 4). In addition, for breakfast, symptomatic patients consumed more bread, while asymptomatic patients consumed more rice (Table 3). Symptomatic patients avoided more foods compared to asymptomatic patients. There were no significant differences in food preferences or avoided foods between symptomatic and asymptomatic patients.

Association between the risk for occurrence of symptoms and dietary intake

There was no significant association between the risk for occurrence of symptoms and dietary intake at postlaparoscopic cholecystectomy (data not shown) (Supplementary Tables 5 and 6). However, at 3 months after laparoscopic cholecystectomy, multivariable-adjusted regression analysis found that the risk for occurrence of symptoms was positively associated with intake of animal protein, cholesterol, and eggs, while it was negatively associated with intake of vegetables, after adjusting for energy intake and exercise frequency (Table 4). There were no significant associations between the risk of symptoms and intake of any other nutrients or foods at 3 months after laparoscopic cholecystectomy (data not shown) (Supplementary Tables 7 and 8).

Table 4. Association between dietary intake and the risk of symptoms 3 months after laparoscopic cholecystectomy by multivariable logistic regression analysis

Variable	Quartile of dietary intake			*p* for trend[a]
	Q1	Q2	Q3	
Animal protein, g				0.038
Number of S/A	7/11	6/12	14/9	
Cut-off	≤ 15.6	15.6 < to ≤ 37.0	> 37.0	
OR (95% CI)[b]	1	0.937 (0.19–4.68)	4.411 (0.92–21.25)	
Cholesterol, mg				0.041
Number of S/A	5/11	6/11	16/10	
Cut-off	≤ 133.4	133.4 < to ≤ 251.6	> 251.6	
OR (95% CI)	1	1.497 (0.30–7.51)	4.937 (1.04–23.48)[c]	
Vegetable, g				0.022
Number of S/A	16/10	8/11	3/11	
Cut-off	≤ 206.6	206.6 < to ≤ 385.7	> 385.7	
OR (95% CI)	1	0.473 (0.12–1.80)	0.125 (0.02–0.74)[c]	
Egg, g				0.023
Number of S/A	8/18	3/7	16/7	
Cut-off	≤ 0	0 < to ≤ 20	> 20	
OR (95% CI)	1	1.046 (0.20–5.40)	5.160 (1.28–20.87)[c]	

S/A, symptomatic patients/asymptomatic patients; OR, odds ratio; CI, confidence interval.
[a]Estimates of *p* values for linear trend were based on linear scores derived from the medians of quartiles for intake of nutrients among asymptomatic patients.
[b]OR was adjusted for total energy intake and exercise frequency.
[c]$p < 0.05$ compared to the first quartile by logistic regression analysis.

DISCUSSION

This study found that the risk of postcholecystectomic syndrome was positively associated with intake of animal protein, cholesterol, and eggs, and negatively associated with intake of vegetables in patients 3 months after laparoscopic cholecystectomy. In addition, 3 months after laparoscopic cholecystectomy, symptomatic patients consumed more bread for breakfast, while asymptomatic patients consumed more rice. However, there was no significant immediately postcholecystectomy association between postcholecystectomic syndrome and dietary intake.

Previous studies indicated that postcholecystectomic diarrhea was reported in patients who did not follow the low-fat diet guidelines [10] and who were intolerant of fatty foods [13]. Bile malabsorption has been shown to be associated with diarrhea in humans [18], and secretion of bile acid was dose dependently associated with fat intake in rats [19]. Thus, previous studies suggested that a high-fat diet could be associated with postcholecystectomic diarrhea, due to the changes in bile acid metabolism. However, the present study did not find a significant association between the intake of fat and the risk for postcholecystectomic syndromes. This inconsistency between the present and previous studies could be because patients in the present study did not consume a high-fat diet, as the average intake of fat was about 25 g/day and only 7% to 8% of the total energy intake.

Postcholecystectomy, patients reported symptoms of flatulent dyspepsia, which could be related to duodenogastric reflux and delayed gastric emptying [7,20]. Previously, food intolerance was observed in patients with postcholecystectomic dyspepsia, particularly, intolerance of eggs [14]. Pelletier et al. [21] also found that breakfast with bread and boiled eggs delayed gastric emptying in healthy volunteers, suggesting that the delayed gastric emptying by consumption of eggs could be positively associated with postcholecystectomic syndromes. Eggs could be a source of animal protein and cholesterol, which were also positively associated with the risk of postcholecystectomic syndromes in the present study. Intake of protein had been reported to slow gastric emptying in healthy volunteers [22], and dietary cholesterol increased fecal excretion of bile acids in rats [23]. Malabsorption of bile acids has been shown to cause postcholecystectomic diarrhea [5,24], since the absence of a gallbladder caused more rapid enterohepatic recycling of bile acids, increased bile acid secretion [3], and shortened colonic transit times [4]. Both the present and previous studies suggested that excretion and malabsorption of bile acids could be exacerbated by cholesterol intake in patients with cholecystectomies.

With the exception of the present study, there are no studies indicating any association between postcholecystectomic syndromes and vegetable intake. However, patients with functional gastrointestinal disorders, such as irritable bowel syndrome, consumed fewer vegetables than did healthy Taiwanese individuals [25]. In addition, dietary fiber has been shown to regulate the enterohepatic circulation of bile acids in patients with ileal resection [26]. In previous *in vivo* and *in vitro* studies, dietary fiber bound with bile acids, and reduced free bile acids in feces [27].

Patients with functional dyspepsia consumed more bread than rice [15], and bread had longer gastric emptying times compared with the rice pudding in healthy volunteers [28]. Gluten in meals has been shown to delay gastric emptying and cause gastrointestinal symptoms, such as bloating, abdominal pain and nausea in patients without celiac disease [29,30]. Similar with previous research, the present study found that symptomatic patients consumed more bread than rice, and symptoms could be due to the delayed gastric emptying of bread.

It has been suggested that cholecystectomy increases the risk for nonalcoholic fatty liver disease, due to increased hepatic triglyceride content [31-33]. In animal studies hepatic synthesis of bile acid was inhibited [34] and free fatty acid flux increased from adipose tissue to liver after a cholecystectomy [33,35]. In addition, a high level of fibroblast growth factor 19 was detected in surgically removed gallbladders from patients with gallbladder disease [36]. Fibroblast growth factor 19 has been shown to suppress the ability of insulin to stimulate hepatic fatty acid synthesis [37]. However, in the present study, there was no significant difference in the prevalence of fatty liver between asymptomatic and symptomatic patients at 3 months after a cholecystectomy.

After cholecystectomy, a slight dilatation of the common bile duct diameter commonly occurs [38], and is possibly associated with postcholecystectomic syndromes [39]. However, several previous studies reported

https://doi.org/10.3904/kjim.2016.223

inconsistent results regarding the association between dilatation of the common bile duct diameter and postcholecystectomic syndromes [38-40]. In the present study, the diameter of the common bile duct increased by less than 1 mm, and was not significantly different between asymptomatic and symptomatic patients 3 months after cholecystectomy.

This study had several limitations. This study had small sample size, and 3 months of follow-up might have been an insufficient duration. In addition, dietary intake was assessed only once, which could be insufficient to determine the usual intake of patients. However, this was the first study that investigated the association between dietary intake and the risk of postcholecystectomic syndromes.

In conclusion, the present study found that postcholecystectomic syndromes were positively associated with the intake of cholesterol, animal protein, and eggs, and negatively associated with the intake of vegetables, suggesting that diet was plays a role in postcholecystectomic syndromes. However, clinical trials are needed to confirm the cause-effect relationship between dietary intake and postcholecystectomic syndromes.

KEY MESSAGE

1. Intake of cholesterol, animal protein, and eggs was positively, but intake of vegetables was negatively associated with postcholecystectomic syndromes.
2. Symptomatic patients consumed more bread-based breakfast foods, while asymptomatic patients consumed more rice.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Acknowledgments

The authors are grateful to the patients and their caregivers for their involvement in this study. This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2015R1D1A1A09060823).

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https://doi.org/10.3904/kjim.2016.223

https://doi.org/10.3904/kjim.2016.223

Supplementary Table 1. Blood biochemical parameters between asymptomatic and symptomatic patients immediately postlaparoscopic cholecystectomy and 3 months after laparoscopic cholecystectomy

Variable	Postlaparoscopic cholecystectomy			Three months after laparoscopic cholecystectomy		
	Asymptomatic (n = 24)	Symptomatic (n = 35)	*p* value	Asymptomatic (n = 32)	Symptomatic (n = 27)	*p* value
White blood cell, 10^9/L	7.76 ± 2.86	9.28 ± 3.94	0.112	6.15 ± 1.79	6.35 ± 1.89	0.675
Hemoglobin, g/L	139.17 ± 11.66	135.68 ± 16.46	0.375	141.31 ± 14.61	136.74 ± 16.80	0.268
Hematocrit, %	0.40 ± 0.03	0.40 ± 0.04	0.675	0.42 ± 0.04	0.40 ± 0.04	0.223
Platelet, 10^9/L	251.25 ± 73.01	250.77 ± 62.10	0.979	233.28 ± 56.39	252.85 ± 48.58	0.163
Total protein, g/L	74.17 ± 5.51	71.77 ± 7.95	0.212	75.34 ± 3.80	75.41 ± 4.38	0.953
Albumin, g/L	42.42 ± 4.53	42.06 ± 3.69	0.739	43.59 ± 2.37	43.15 ± 2.64	0.497
FBS, mmol/L	6.92 ± 2.36	6.89 ± 2.11	0.953	5.84 ± 0.65	6.17 ± 1.39	0.265
Creatinine, μmol/L	77.46 ± 15.88	93.35 ± 66.83	0.259	81.69 ± 21.78	106.34 ± 159.89	0.391
BUN, mmol/L	4.99 ± 1.35	5.50 ± 1.62	0.212	5.35 ± 1.67	5.53 ± 3.94	0.821
AST, μkat/L	1.07 ± 1.21	0.70 ± 1.01	0.211	0.45 ± 0.39	0.35 ± 0.21	0.230
ALP, μkat/L	1.10 ± 0.37	1.09 ± 0.41	0.933	0.98 ± 0.39	1.04 ± 0.39	0.608
Triglycerides, mmol/L	1.72 ± 1.22	1.33 ± 0.79	0.152	1.51 ± 1.29	1.71 ± 1.06	0.527
TC, mmol/L	4.69 ± 0.98	4.76 ± 1.19	0.799	4.74 ± 0.86	4.85 ± 0.89	0.633
HDL-C, mmol/L	1.12 ± 0.25	1.18 ± 0.31	0.399	1.24 ± 0.26	1.21 ± 0.31	0.713
LDL-C, mmol/L	2.74 ± 0.98	2.74 ± 0.95	0.989	2.73 ± 0.84	2.87 ± 0.79	0.517

Values are presented as mean ± SD. *p* values were determined by independent *t* test between symptomatic and asymptomatic patients at post-surgery and 3 months after surgery, respectively.

FBS, fasting blood sugar; BUN, blood urea nitrogen; AST, alanine aminotransferase; ALP, alkaline phosphatase; TC, total cholesterol; HDL-C, high density lipoprotein cholesterol; LDL-C, low density lipoprotein cholesterol.

Supplementary Table 2. Daily intake of nutrients between asymptomatic and symptomatic patients at postlaparoscopic cholecystectomy

Variable	Asymptomatic (n = 24)	Symptomatic (n = 35)	*p* value
Energy, kcal	2,045.22 ± 798.91	2,230.51 ± 715.96	0.356
Carbohydrate, g/1,000 kcal	149.77 ± 21.75	153.73±24.12	0.522
Lipid, g/1,000 kcal	26.19 ± 7.04	25.80 ± 7.99	0.848
Protein, g/1,000 kcal	39.32 ± 6.58	39.10 ± 7.43	0.909
Fiber, g/1,000 kcal	10.63 ± 2.69	11.84 ± 3.19	0.133
Vitamin A, μg RE/1,000 kcal	365.38 ± 212.55	457.45 ± 282.63	0.181
Vitamin D, μg/1,000 kcal	1.68 ± 1.01	1.63 ± 0.65	0.819
Vitamin E, mg/1,000 kcal	7.22 ± 1.68	8.03 ± 2.03	0.115
Vitamin K, μg/1,000 kcal	74.78 ± 32.96	94.94 ± 48.37	0.081
Thiamin, mg/1,000 kcal	0.66 ± 0.10	0.67 ± 0.12	0.588
Vitamin B_6, mg/1,000 kcal	0.81 ± 0.15	0.86 ± 0.18	0.287
Folate, μg/1,000 kcal	254.56 ± 74.74	279.94 ± 90.20	0.261
Vitamin B_{12}, μg/1,000 kcal	4.37 ± 1.38	4.55 ± 1.71	0.674
Vitamin C, mg/1,000 kcal	55.44 ± 32.14	60.33 ± 31.79	0.566
Calcium, mg/1,000 kcal	270.06 ± 87.51	271.24 ± 81.75	0.958
Phosphorus, mg/1,000 kcal	581.81 ± 84.08	587.93 ± 103.66	0.811
Sodium, mg/1,000 kcal	1,945.34 ± 526.00	2,142.26 ± 559.64	0.179
Potassium, mg/1,000 kcal	1,379.41 ± 379.87	1,492.63 ± 432.08	0.304
Magnesium, mg/1,000 kcal	39.48 ± 9.80	42.60 ± 14.07	0.351
Iron, mg/1,000 kcal	7.48 ± 1.22	8.11 ± 1.61	0.110
Zinc, mg/1,000 kcal	5.74 ± 0.94	5.70 ± 1.06	0.861
Copper, mg/1,000 kcal	0.62 ± 0.10	0.65 ± 0.13	0.382
Selenium, μg/1,000 kcal	50.84 ± 7.00	49.37 ± 8.65	0.491
Cholesterol, mg/1,000 kcal	178.57 ± 58.41	187.30 ± 61.68	0.588

Values are presented as mean ± SD. *p* values were determined by independent *t* test.
RE, retinol equivalent.

https://doi.org/10.3904/kjim.2016.223

Supplementary Table 3. Intake of foods between asymptomatic and symptomatic patients at postlaparoscopic cholecystectomy

Variable	Asymptomatic (n = 24)	Symptomatic (n = 35)	*p* value
Grain, g	311.38 ± 123.01	363.54 ± 196.57	0.216
Potato, g	38.88 ± 35.32	47.99 ± 45.39	0.412
Legume, g	94.10 ± 84.33	95.88 ± 99.05	0.943
Vegetable, g	228.28 ± 170.84	306.54 ± 233.70	0.166
Fruit, g	247.64 ± 253.29	260.85 ± 186.93	0.819
Meat, g	120.01 ± 136.81	100.71 ± 106.67	0.546
Egg, g	25.05 ± 23.78	29.09 ± 22.00	0.504
Fish and seafood, g	73.77 ± 62.13	67.28 ± 64.61	0.702
Dairy product, g	142.00 ± 136.99	145.97 ± 123.87	0.908
Beverage, g	335.87 ± 269.61	285.45 ± 278.54	0.492
Others, g	49.75 ± 44.40	46.82 ± 65.68	0.492

Values are presented as mean ± SD. *p* values were determined by independent *t* test.

Supplementary Table 4. Daily intake of nutrients and foods between asymptomatic and symptomatic patients at 3 months after laparoscopic cholecystectomy

Variable	Asymptomatic (n = 32)	Symptomatic (n = 27)	*p* value
Vitamin A, μg RE/1,000 kcal	541.79 ± 590.00	479.65 ± 323.31	0.627
Vitamin D, μg/1,000 kcal	2.67 ± 8.92	2.28 ± 3.07	0.828
Vitamin E, mg/1,000 kcal	8.89 ± 5.25	8.45 ± 4.62	0.734
Vitamin K, μg/1,000 kcal	121.55 ± 107.13	124.71 ± 119.64	0.915
Thiamin, mg/1,000 kcal	0.69 ± 0.32	0.65 ± 0.20	0.540
Vitamin B_6, mg/1,000 kcal	0.85 ± 0.34	0.79 ± 0.39	0.527
Folate, μg/1,000 kcal	268.11 ± 119.80	242.39 ± 121.03	0.417
Vitamin B_{12}, μg/1,000 kcal	5.88 ± 5.58	5.90 ± 4.30	0.993
Vitamin C, mg/1,000 kcal	66.85 ± 33.81	57.85 ± 48.90	0.409
Calcium, mg/1,000 kcal	273.00 ± 110.07	253.72 ± 118.82	0.521
Phosphorus, mg/1,000 kcal	541.06 ± 145.25	567.06 ± 192.75	0.557
Sodium, mg/1,000 kcal	2,535.20 ± 897.13	2,449.44 ± 909.92	0.718
Potassium, mg/1,000 kcal	1,577.74 ± 528.12	1,636.90 ± 692.54	0.711
Magnesium, mg/1,000 kcal	43.85 ± 30.73	49.39 ± 32.80	0.507
Iron, mg/1,000 kcal	8.87 ± 4.40	9.16 ± 4.47	0.800
Zinc, mg/1,000 kcal	5.45 ± 2.01	5.26 ± 1.90	0.715
Copper, mg/1,000 kcal	0.71 ± 0.39	0.68 ± 0.37	0.771
Selenium, μg/1,000 kcal	39.81 ± 17.59	40.96 ± 29.63	0.853
Sweets, g	17.23 ± 43.37	16.85 ± 42.00	0.973
Legumes, g	33.01 ± 55.21	28.90 ± 47.43	0.763
Seaweeds, g	2.98 ± 4.73	2.72 ± 3.97	0.827
Oils and seeds, g	13.48 ± 10.36	9.52 ± 10.98	0.160
Beverage, g	203.93 ± 284.96	276.59 ± 319.67	0.360
Seasonings, g	35.47 ± 28.67	25.64 ± 17.38	0.126

Values are presented as mean ± SD. *p* values were determined by independent *t* test.
RE, retinol equivalent.

https://doi.org/10.3904/kjim.2016.223

Supplementary Table 5. Association between nutrients intake and the risk of symptom at postlaparoscopic cholecystectomy by multivariable logistic regression analysis

Variable	Quartile of dietary intake			*p* for trend[a]
	Q1	Q2	Q3	
Carbohydrate, g				
Number of S/A	6/8	8/8	21/8	
Cut-off	≤ 237.1	237.1 < to ≤ 319.6	> 319.6	0.185
OR (95% CI)[b]	1	1.203 (0.25–5.86)	3.825 (0.54–27.29)	
Lipid, g				
Number of S/A	5/8	16/8	14/8	
Cut-off	≤ 34.9	34.9 < to ≤ 59.5	> 59.5	0.399
OR (95% CI)	1	3.102 (0.57–16.95)	3.121 (0.34–28.76)	
Protein, g				
Number of S/A	3/8	18/8	14/8	
Cut-off	≤ 53.7	53.7 < to ≤ 90.5	> 90.5	0.462
OR (95% CI)	1	4.667 (0.75–29.02)	3.897 (0.31–49.00)	
Fiber, g				
Number of S/A	6/9	8/8	21/7	
Cut-off	≤ 16.3	16.3 < to ≤ 23.9	> 23.9	0.072
OR (95% CI)	1	1.865 (0.37–9.39)	5.123 (0.81–32.53)	
Vitamin A, μg RE				
Number of S/A	6/8	13/8	16/8	
Cut-off	≤ 489.7	489.7 < to ≤ 792.6	> 792.6	0.388
OR (95% CI)	1	1.881 (0.38–9.35)	2.542 (0.38–16.84)	
Vitamin D, μg				
Number of S/A	10/8	11/8	14/8	
Cut-off	≤ 2.0	2.0 < to ≤ 3.7	> 3.7	0.762
OR (95% CI)	1	0.820 (0.18–3.69)	1.167 (0.20–6.78)	
Vitamin E, mg				
Number of S/A	5/8	15/8	15/8	
Cut-off	≤ 11.4	11.4 < to ≤ 16.2	> 16.2	0.823
OR (95% CI)	1	2.419 (0.44–13.35)	1.922 (0.22–16.78)	
Vitamin K, μg				
Number of S/A	5/8	11/8	19/8	
Cut-off	≤ 96.6	96.6 < to ≤ 163.0	> 163.0	0.348
OR (95% CI)	1	1.319 (0.27–6.54)	2.263 (0.37–13.80)	
Thiamin, mg				
Number of S/A	4/8	13/8	18/8	
Cut-off	≤ 0.9	0.9 < to ≤ 1.4	> 1.4	0.177
OR (95% CI)	1	2.741 (0.47–15.83)	5.463 (0.54–54.82)	
Vitamin B_6, mg				
Number of S/A	4/8	19/8	12/8	
Cut-off	≤ 1.2	1.2 < to ≤ 2.0	> 2.0	0.778
OR (95% CI)	1	3.791 (0.62–23.08)	2.093 (0.20–22.33)	
Folate, μg				
Number of S/A	6/8	8/8	21/8	

Supplementary Table 5. Continued

Variable	Quartile of dietary intake			*p* for trend[a]
	Q1	Q2	Q3	
Cut-off	≤ 358.2	358.2 < to ≤ 550.8	> 550.8	0.117
OR (95% CI)	1	1.559 (0.28–8.69)	4.357 (0.57–33.37)	
Vitamin B_{12}, μg				
Number of S/A	11/8	8/8	16/8	
Cut-off	≤ 7.2	7.2 < to ≤ 9.8	> 9.8	0.958
OR (95% CI)	1	0.480 (0.10–2.22)	0.861 (0.17–4.29)	
Vitamin C, mg				
Number of S/A	3/8	12/8	20/8	
Cut-off	≤ 59.5	59.5 < to ≤ 106.7	> 106.7	0.085
OR (95% CI)	1	3.103 (0.55–17.59)	5.914 (0.96–36.52)	
Calcium, mg				
Number of S/A	8/8	10/8	17/8	
Cut-off	≤ 384.3	384.3 < to ≤ 612.8	> 612.8	0.239
OR (95% CI)	1	1.319 (0.27–6.36)	2.834 (0.43–18.55)	
Phosphorus, mg				
Number of S/A	5/8	19/8	11/8	
Cut-off	≤ 802.8	802.8 < to ≤ 1,425.1	> 1,425.1	0.966
OR (95% CI)	1	2.947 (0.52–16.69)	1.278 (0.11–14.76)	
Sodium, mg				
Number of S/A	6/8	12/8	17/8	
Cut-off	≤ 2,901.2	2,901.2 < to ≤ 4,395.9	> 4,395.9	0.362
OR (95% CI)	1	1.927 (0.38–9.72)	2.819 (0.35–22.79)	
Potassium, mg				
Number of S/A	5/8	9/8	21/8	
Cut-off	≤ 2,055.7	2,055.7 < to ≤ 2,976.0	> 2,976.0	0.055
OR (95% CI)	1	2.269 (0.42–12.27)	7.322 (0.93–57.92)	
Magnesium, mg				
Number of S/A	6/8	15/8	14/8	
Cut-off	≤ 56.0	56.0 < to ≤ 102.8	> 102.8	0.925
OR (95% CI)	1	2.120 (0.40–11.23)	1.646 (0.22–12.26)	
Iron, mg				
Number of S/A	5/8	12/8	18/8	
Cut-off	≤ 11.7	11.7 < to ≤ 16.7	> 16.7	0.157
OR (95% CI)	1	2.933 (0.53–16.34)	5.667 (0.60 – 53.1)	
Zinc, mg				
Number of S/A	6/8	14/8	15/8	
Cut-off	≤ 8.2	8.2 < to ≤ 12.6	> 12.6	0.620
OR (95% CI)	1	2.033 (0.37–11.10)	2.218 (0.23–20.98)	
Copper, mg				
Number of S/A	7/8	12/8	16/8	
Cut-off	≤ 1.0	1.0 < to ≤ 1.4	> 1.4	0.535
OR (95% CI)	1	1.723 (0.33–9.04)	2.045 (0.28–15.05)	
Selenium, μg				

https://doi.org/10.3904/kjim.2016.223

Supplementary Table 5. Continued

Variable	Quartile of dietary intake			*p* for trend[a]
	Q1	Q2	Q3	
Number of S/A	9/8	15/8	11/8	
Cut-off	≤ 78.3	78.3 < to ≤ 118.8	> 118.8	0.399
OR (95% CI)	1	0.947 (0.17–5.16)	0.370 (0.03–5.09)	
Cholesterol, mg				
Number of S/A	9/8	11/8	15/8	
Cut-off	≤ 269.2	269.2 < to ≤ 414.5	> 414.5	0.781
OR (95% CI)	1	1.216 (0.28–5.30)	1.331 (0.21–8.22)	

S/A, symptomatic/asymptomatic; OR, odds ratio; CI, confidence interval; RE, retinol equivalent.
[a]Estimates of *p* values for a linear trend were based on linear scores derived from the medians of quartiles for intake of nutrients among asymptomatic patients.
[b]OR was adjusted for total energy intake and medical of digestive system disease.

Supplementary Table 6. Association between food intake and the risk of symptom at postlaparoscopic cholecystectomy by multivariable logistic regression analysis

Variable	Quartile of dietary intake			*p* for trend[a]
	Q1	Q2	Q3	
Grain, g				
Number of S/A	13/8	3/8	19/8	
Cut-off	≤ 253.7	253.7 < to ≤ 346.5	> 346.5	0.873
OR (95% CI)[b]	1	0.185 (0.03–1.05)	1.050 (0.23–4.76)	
Potato, g				
Number of S/A	7/8	17/8	11/8	
Cut-off	≤ 13.2	13.2 < to ≤ 47.1	> 47.1	0.649
OR (95% CI)	1	3.008 (0.71–12.75)	1.312 (0.29–5.94)	
Legume, g				
Number of S/A	12/8	14/8	9/8	
Cut-off	≤ 38.4	38.4 < to ≤ 122.8	> 122.8	0.461
OR (95% CI)	1	0.732 (0.18–2.91)	0.550 (0.13–2.40)	
Vegetable, g				
Number of S/A	6/8	11/8	18/8	
Cut-off	≤ 126.3	126.3 < to ≤ 222.3	> 222.3	0.434
OR (95% CI)	1	2.034 (0.45–9.16)	2.223 (0.46–10.83)	
Fruit, g				
Number of S/A	8/8	7/8	20/8	
Cut-off	≤ 120.4	120.4 < to ≤ 187.2	> 187.2	0.229
OR (95% CI)	1	0.667 (0.14–3.09)	1.690 (0.43–6.70)	
Meat, g				
Number of S/A	17/8	8/8	10/8	
Cut-off	≤ 50.7	50.7 < to ≤ 129.3	> 129.3	0.274
OR (95% CI)	1	0.369 (0.09–1.54)	0.361 (0.08–1.69)	
Egg, g				
Number of S/A	8/9	11/7	16/8	
Cut-off	≤ 15.2	15.2 < to ≤ 31.2	> 31.2	0.382
OR (95% CI)	1	1.159 (0.24–5.49)	1.788 (0.43–7.36)	
Fish and seafood, g				
Number of S/A	14/8	13/8	8/8	
Cut-off	≤ 40.6	40.6 < to ≤ 88.6	> 88.6	0.355
OR (95% CI)	1	1.205 (0.32–4.60)	0.503 (0.10–2.42)	
Dairy product, g				
Number of S/A	12/8	10/8	13/8	
Cut-off	≤ 56.9	56.9 < to ≤ 174.6	> 174.6	0.609
OR (95% CI)	1	0.413 (0.09–1.98)	1.195 (0.29–4.94)	
Beverage, g				
Number of S/A	16/8	11/8	8/8	
Cut-off	≤ 177.1	177.1 < to ≤ 423.6	> 423.6	0.311
OR (95% CI)	1	0.822 (0.20–3.31)	0.428 (0.09–2.15)	
Others, g				
Number of S/A	17/8	9/8	9/8	
Cut-off	≤ 20.9	20.9 < to ≤ 57.1	> 57.1	0.249
OR (95% CI)	1	0.417 (0.10–1.71)	0.332 (0.07–1.48)	

S/A, symptomatic/asymptomatic; OR, odds ratio; CI, confidence interval.

[a]Estimates of *p* values for a linear trend were based on linear scores derived from the medians of quartiles for intake of nutrients among asymptomatic patients.

[b]OR was adjusted for total energy intake and medical of digestive system disease.

https://doi.org/10.3904/kjim.2016.223

Supplementary Table 7. Association between nutrients intake and the risk of symptom at 3 months after laparoscopic cholecystectomy by multivariable logistic regression analysis

Variable	Quartile of dietary intake			*p* for trend[a]
	Q1	Q2	Q3	
Carbohydrate, g				
Number of S/A	13/10	8/11	6/11	
Cut-off	≤ 218.4	218.4 < to ≤ 282.2	> 282.2	0.116
OR (95% CI)[b]	1	0.479 (0.11–2.07)	0.244 (0.04–1.42)	
Lipid, g				
Number of S/A	12/10	6/11	9/11	
Cut-off	≤ 33.4	33.4 < to ≤ 45.4	> 45.4	0.612
OR (95% CI)	1	0.476 (0.11–1.98)	0.728 (0.13–4.05)	
Protein, g				
Number of S/A	8/11	3/9	16/12	
Cut-off	≤ 47.1	47.1 < to ≤ 66.5	> 66.5	0.052
OR (95% CI)	1	0.727 (0.12–4.29)	4.576 (0.90–23.17)	
Plant protein, g				
Number of S/A	15/10	5/11	7/11	
Cut-off	≤ 29.4	29.4 < to ≤ 38.1	> 38.1	0.456
OR (95% CI)	1	0.238 (0.05–1.09)	0.568 (0.13–2.54)	
Fiber, g				
Number of S/A	12/11	11/10	4/11	
Cut-off	≤ 16.7	16.7 < to ≤ 23.8	> 23.8	0.137
OR (95% CI)	1	1.329 (0.36–4.87)	0.333 (0.07–1.68)	
Vitamin A, μg RE				
Number of S/A	9/10	9/11	9/11	
Cut-off	≤ 420.0	420.0 < to ≤ 891.9	> 891.9	0.614
OR (95% CI)	1	0.642 (0.16–2.52)	0.652 (0.16–2.70)	
Vitamin D, μg				
Number of S/A	5/10	7/11	15/11	
Cut-off	≤ 0.2	0.2 < to ≤ 1.5	> 1.5	0.062
OR (95% CI)	1	1.258 (0.26–6.14)	3.544 (0.79–15.98)	
Vitamin E, mg				
Number of S/A	11/10	10/11	6/11	
Cut-off	≤ 10.5	10.5 < to ≤ 17.2	> 17.2	0.249
OR (95% CI)	1	0.799 (0.22–2.91)	0.380 (0.08–1.78)	
Vitamin K, μg				
Number of S/A	11/11	7/10	9/11	
Cut-off	≤ 94.3	94.3 < to ≤ 205.5	> 205.5	0.756
OR (95% CI)	1	0.603 (0.15–2.43)	0.778 (0.21–2.86)	
Thiamin, mg				
Number of S/A	11/10	8/11	8/11	
Cut-off	≤ 0.9	0.9 < to ≤ 1.2	> 1.2	0.600
OR (95% CI)	1	0.762 (0.20–2.96)	0.675 (0.15–30.00)	
Vitamin B_6, mg				
Number of S/A	14/11	9/11	4/10	

Supplementary Table 7. Continued

Variable	Quartile of dietary intake			*p* for trend[a]
	Q1	Q2	Q3	
Cut-off	≤ 1.1	1.1 < to ≤ 1.7	> 1.7	0.203
OR (95% CI)	1	0.667 (0.19–2.38)	0.342 (0.07–1.70)	
Folate, μg				
Number of S/A	12/10	10/11	5/11	
Cut-off	≤ 326.6	326.6 < to ≤ 526.2	> 526.2	0.183
OR (95% CI)	1	0.803 (0.22–2.92)	0.357 (0.08–1.64)	
Vitamin B_{12}, μg				
Number of S/A	10/10	9/11	8/11	
Cut-off	≤ 5.2	5.2 < to ≤ 9.5	> 9.5	0.887
OR (95% CI)	1	0.866 (0.22–3.37)	0.886 (0.23–3.48)	
Vitamin C, mg				
Number of S/A	17/10	4/13	6/9	
Cut-off	≤ 82.8	82.8 < to ≤ 133.9	> 133.9	0.089
OR (95% CI)	1	0.238 (0.06–1.01)	0.355 (0.09–1.47)	
Calcium, mg				
Number of S/A	14/11	5/9	8/12	
Cut-off	≤ 372.4	372.4 < to ≤ 457.6	> 457.6	0.374
OR (95% CI)	1	0.520 (0.12–2.30)	0.524 (0.14–1.97)	
Phosphorus, mg				
Number of S/A	10/10	10/11	7/11	
Cut-off	≤ 759.3	759.3< to ≤ 1,041.6	> 1,041.6	0.927
OR (95% CI)	1	1.655 (0.40–6.61)	0.995 (0.19–5.23)	
Sodium, mg				
Number of S/A	14/10	5/11	8/11	
Cut-off	≤ 3,370.6	3,370.6 < to ≤ 4,601.8	> 4,601.8	0.758
OR (95% CI)	1	0.260 (0.05–1.25)	0.670 (0.16–2.90)	
Potassium, mg				
Number of S/A	7/10	15/11	5/11	
Cut-off	≤ 1,951.7	1,951.7 < to ≤ 2,966.7	> 2,966.7	0.976
OR (95% CI)	1	3.940 (0.85–18.21)	1.359 (0.25–7.52)	
Magnesium, mg				
Number of S/A	7/10	8/11	12/11	
Cut-off	≤ 45.3	45.3 < to ≤ 81.6	> 81.6	0.236
OR (95% CI)	1	1.536 (0.34–6.88)	2.425 (0.56–10.57)	
Iron, mg				
Number of S/A	10/10	8/11	9/11	
Cut-off	≤ 10.6	10.6 < to ≤ 15.3	> 15.3	0.987
OR (95% CI)	1	0.598 (0.14–2.62)	0.912 (0.23–3.67)	
Zinc, mg				
Number of S/A	11/10	8/11	8/11	
Cut-off	≤ 7.0	7.0 < to ≤ 10.4	> 10.4	0.893
OR (95% CI)	1	0.845 (0.22–3.27)	0.906 (0.21–3.94)	
Copper, mg				

https://doi.org/10.3904/kjim.2016.223

Supplementary Table 7. Continued

Variable	Quartile of dietary intake			*p* for trend[a]
	Q1	Q2	Q3	
Number of S/A	13/10	8/11	6/11	
Cut-off	≤ 0.9	0.9 < to ≤ 1.3	> 1.3	0.310
OR (95% CI)	1	0.664 (0.18–2.50)	0.466 (0.11–1.92)	
Selenium, μg				
Number of S/A	14/10	6/11	7/11	
Cut-off	≤ 47.0	47.0 < to ≤ 78.2	> 78.2	0.371
OR (95% CI)	1	0.417 (0.11–1.66)	0.511 (0.13–2.05)	

S/A, symptomatic/asymptomatic; OR, odds ratio; CI, confidence interval; RE, retinol equivalent.
[a]Estimates of *p* values for a linear trend were based on linear scores derived from the medians of quartiles for intake of nutrients among asymptomatic.
[b]OR was adjusted for total energy, exercise frequency.

Supplementary Table 8. Association between food intake and the risk of symptom at 3 months after laparoscopic cholecystectomy by multivariable logistic regression analysis

Variable	Quartile of dietary intake			*p* for trend[a]
	Q1	Q2	Q3	
Grain, g				
Number of S/A	16/10	5/11	6/11	
Cut-off	≤ 190.0	190.0 < to ≤ 279.9	> 279.9	0.230
OR (95% CI)[b]	1	0.281 (0.07–1.21)	0.377 (0.08–1.81)	
Potato, g				
Number of S/A	16/13	3/8	8/11	
Cut-off	≤ 0	0 < to ≤ 19.8	> 19.8	0.565
OR (95% CI)	1	0.289 (0.06–1.50)	0.515 (0.14–1.89)	
Sweet, g				
Number of S/A	11/11	14/11	2/10	
Cut-off	≤ 5.5	5.5 < to ≤ 13.8	> 13.8	0.094
OR (95% CI)	1	0.852 (0.24–3.06)	0.212 (0.03–1.35)	
Legume, g				
Number of S/A	8/12	9/9	10/11	
Cut-off	≤ 0	0 < to ≤ 20.0	> 20.0	0.830
OR (95% CI)	1	1.489 (0.37–60)	0.998 (0.25–3.94)	
Fruit, g				
Number of S/A	10/10	6/11	11/11	
Cut-off	≤ 93.4	93.4 < to ≤ 211.7	> 211.7	0.569
OR (95% CI)	1	0.463 (0.11–1.94)	0.632 (0.19–2.7)	
Meat, g				
Number of S/A	9/11	7/10	11/11	
Cut-off	≤ 0	0 < to ≤ 71.7	> 71.7	0.554
OR (95% CI)	1	0.582 (0.13–2.55)	0.124 (0.33–4.64)	
Fish and seafood, g				
Number of S/A	11/10	8/11	8/11	
Cut-off	≤ 14.5	14.5 < to ≤ 79.5	> 79.5	0.839
OR (95% CI)	1	0.657 (0.17–2.55)	0.779 (0.20–3.00)	
Seaweed, g				
Number of S/A	12/14	8/8	7/10	
Cut-off	≤ 0	0 < to ≤ 3.0	> 3.0	0.404
OR (95% CI)	1	1.265 (0.33–4.90)	0.531 (0.13–2.21)	
Dairy product, g				
Number of S/A	12/13	5/8	10/11	
Cut-off	≤ 0	0 < to ≤ 74.0	> 74.0	1.000
OR (95% CI)	1	0.588 (0.13–2.59)	0.854 (0.24–3.02)	
Oil and seed, g				
Number of S/A	14/9	7/12	6/11	
Cut-off	≤ 6.5	6.5 < to ≤ 13.6	> 13.6	0.109
OR (95% CI)	1	0.246 (0.06–1.05)	0.302 (0.07–1.29)	
Beverage, g				
Number of S/A	9/10	5/11	13/11	

https://doi.org/10.3904/kjim.2016.223

Supplementary Table 8. Continued

Variable	Quartile of dietary intake			*p* for trend[a]
	Q1	Q2	Q3	
Cut-off	≤ 1.0	1.0 < to ≤ 237.3	> 237.3	0.598
OR (95% CI)	1	0.315 (0.06–1.56)	1.025 (0.20–3.94)	
Seasoning, g				
Number of S/A	12/10	12/11	3/11	
Cut-off	≤ 21.9	21.9 < to ≤ 42.0	> 42.0	0.063
OR (95% CI)	1	1.037 (0.29–3.74)	0.179 (0.03–1.06)	

S/A, symptomatic/asymptomatic; OR, odds ratio; CI, confidence interval.
[a]Estimates of *p* values for a linear trend were based on linear scores derived from the medians of quartiles for intake of nutrients among asymptomatic.
[b]OR was adjusted for total energy, exercise frequency.