Risks of Repeated Visits for Uninvestigated Dyspepsia in Three Community Hospitals of Khon Kaen, Thailand

Amorn Premgamone MD*, Srinoi Maskasem MSc*,
Apisit Thamrongwarangoon MD**, Wichai Ussavaphark MD**

** Department of Community Medicine, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand*
*** Ubolratana Community Hospital, Khon Kaen, Thailand*
**** Nam Pong Community Hospital, Khon Kaen, Thailand*

Background: *Uninvestigated dyspepsia (UD) is common and only 26.4% of these are peptic ulcer disease, while 50% are non-ulcer dyspepsia. A recent study found that nephrolithiasis with urinary tract infection may have the dyspeptic symptoms.*
Objective: *The authors searched for any associations between repeated UD and pyuria, hematuria and other factors.*
Material and Method: *A case-control study was performed. It consisted of 489 patients with repeated UD who had visited community hospitals for at least two times per year and 489 controls sampled from the data of the subjects, free of dyspeptic symptoms, from the multi-stage random survey for subjective health complaints in the same province. Multivariate logistic regression models were used for case-control comparisons.*
Results: *By logistic regression analysis, UD was significantly associated with problems caused by purine-rich foods (PRFs), chronic fatigue, flank paresthesia, hematuria, myofascial pain, and pyuria. The respective adjusted odds ratios and 95% confidence interval (CI) were: 6.67 (4.58, 9.68), 5.06 (3.46, 7.40), 3.98 (2.41, 6.60), 2.97 (2.01, 4.38), 1.91 (1.32, 2.76) and 1.58 (1.01, 2.45). The variables of age (>48), sex, dysuria, poly-arthralgia, headache and back pain were not significantly associated with UD. The foods that aggravated UD were bamboo shoots, fermented rice noodles, beef, alcohol and insects. The rate of pyuria and hematuria was significantly increased with the number of visits within a year [p-value (Chi-square for trend), 0.015 and 0.032].*
Conclusion: *These findings indicate that pyuria, hematuria, and purine-rich foods were associated with repeated hospital visits for dyspepsia.*

Keywords*: Bamboo shoots, Purine-rich foods, Nephrolithiasis, Urinary red blood cell, Urinary white blood cell, Dyspepsia*

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The prevalence of dyspepsia varies according to the definition used and between populations. When a broader definition of "upper gastrointestinal symptoms" is used to define dyspepsia, prevalences 23 to 45% of uninvestigated dyspepsia (UD)[1-3] were observed. In population studies that use the Rome I Criteria to define UD, prevalence from 18 to 38% were observed[4,5]. UD may be an early symptom of a serious illness such as peptic ulceration, cholelithiasis, or gastric carcinoma, even though often no organic lesion is found. A review of 22 studies investigating dyspepsia found that overall, 50% of gastroscopies were non-ulcer dyspepsia (NUD), while 33% were gastroduodenal ulceration, 12% revealed reflux esophagitis and 1.2% malignancy[6].

The various theories proposed for the causes of NUD range from infection (*H. pylori*), inflammation and acid mucosal damage to dysmotility, delayed gastric emptying, gastric hypersensitivity and central nervous system (autonomic) dysfunction[7-9]. Experimental animal studies by Budgell and Sato[10,11] demonstrated that somatic stimuli can elicit various gastric reflexes, including gastric motility changes. The role of the autonomic nervous system in the production and modulation of the viscera is well-documented and these somatovisceral reflexes may be responsible for some NUD symptoms. Since the exact cause of NUD remains elusive these latter theories form the basis for the chiropractic model used to relieve NUD symptoms by either the termination of somatovisceral reflexes or the restoration of some of these reflexes to normalize GI physiology[12].

In Thailand, UD is a common symptom with

Correspondence to: Premgamone A, Department of Community Medicine, Faculty of Medicine, Khon Kaen University, Mitrapap Road, Khon Kaen 40002, Thailand. Phone: 043-348-391, Fax: 043-202-488, E-mail: amorn_p@kku.ac.th

approximately 30% prevalence in the community[13]. Chunlertrith et al[14] studied the etiology of dyspepsia in a university hospital in Northeast Thailand and reported: "functional dyspepsia" or non-ulcer dyspepsia (NUD) (53.3%), peptic ulcer disease (26.4%) and hepato-biliary diseases (16.8%) as the causes. Patients presenting with dyspepsia at community hospitals in Thailand, where there is no access to endoscopy were labeled as UD.

Another study in Thailand revealed that patients with large kidney stones (KS), with pyuria (positive for white blood cells) and/or hematuria (red blood cells in the urine) usually had concurrent multiple chronic health complaints (MCHC), including: dyspepsia (51.2%), myofascial pain (41.5%) and joint pain (68.3%). More than 90% of these persons reported a substantial reduction of these symptoms when they were treated with antibiotics plus *Orthosiphon grandiflorus* or sodium potassium citrate without any other medication[15].

A group of favorite foods, such as fermented rice noodles, bamboo shoots, beef and insects, was strongly associated with gastro-intestinal complaints (*viz.*, heartburn, stomach discomfort, ulcer and non-ulcer dyspepsia, stomach pain, gas discomfort, diarrhea, constipation) and other subjective health complaints in the Northeast[13]. These foods can induce an acute gouty attack among known sufferers of gout; therefore, were called purine-rich foods (PRFs).

No other reports in, northeast Thailand revealing the association between UD and kidney stones or urinary tract infection, has been published. The present study therefore aimed to investigate the association between UD and pyuria, hematuria, PRF aggravation at the community hospitals of Khon Kaen, Thailand.

Material and Method

Sampling Method and Data Collection

This was a case-controlled study conducted between November 2003 and October 2004. The research was supported by Khon Kaen University and the protocol was approved by the Ethics Committee of Khon Kaen University in 2003 (HE 460427). Verbal, informed consent was obtained from the subjects. The sample size calculation was based on an assumed 18 and 26% prevalence of pyuria among the controls and cases, which was 444 per group. It was decided to have 489 subjects per group for the variation in the prevalence of other factors. The study was done in 3 districts by simple random sampling from the list of all districts of Khon Kaen Province.

Cases were the dyspeptic patients visiting the out-patient department, who met the inclusion criteria and were willing to participate. Included were cases who: (i) presented with a chief complaint of dyspepsia; (ii) had at least twice visits to the hospital or health center within the year for dyspepsia; (iii) lived in the district; (iv) were between 15-65 years of age. The authors excluded subjects who: (i) had severe or acute abdominal pain or (ii) were known to have cancer.

Controls came from a database file of subjects free from dyspeptic symptoms in a community-based study in the Khon Kaen Province[13], where 1,128 subjects from 16 rural villages, between 15 and 65 years of age, were randomly selected by multistage sampling. Data on intake of PRFs, subjective health complaints (29 items), socio-economic factors, results of urine strip tests and ultrasonography were available for each subject. There were 645 subjects who were free from dyspepsia, from which 489 subjects were randomly selected to be the controls.

On working days in the out patient department of the community hospital, the trained nurse recruited the eligible dyspeptic patients who met the inclusion criteria. The subjects were interviewed by the research assistant and spot urine was collected for a urine strip test read by a portable urine analyzer (UriluxS, Roche, Basel, Switzerland). Approximately one-third of the cases for each working date had been sampled and asked to join Step 2, where subjects underwent ultrasonography (US) on the appointed day. The research assistant created consecutive numbers for the subjects, then made appointments for the subjects according to the coded number prepared and kept in an envelope by the principal investigator for each working day. There were 168 cases who received US.

The Ultrasonography (US) and the Hyperechoic Foci (HYF)

The US used in the present study was 256-grey-scale and the scanning method was the multiple anatomical approaches, which included the prone, decubitus and supine views obtained in the transverse, longitudinal and oblique planes. Small kidney stones are difficult to diagnose and usually appeared as hyper-echoic foci (HYF) with or without acoustic shadowing. A subject was counted when HYF was found and recorded its longest diameter. The number of subjects with kidney stones was calculated according to the rates obtained from a previous study done in a similar context, but where the researchers compared the US

result with unenhanced helical computed tomography (UHCT)[16].

The HYF considered significant in the present study appeared with or without acoustic shadowing, but it had to be denser than the renal vascular tissue and its location was not in the distribution of vascular tissue and had related calyectasis. When there were multiple foci, the longest diameter of the largest hyperechoic focus was measured and recorded. Only 168 subjects in the UD received US, while all of the controls (489) already had the US results from the database.

Food Aggravation

Bamboo shoots (BB), beef, insects were classified as PRFs in the present study. Fermented rice noodles (FN) as well as alcohol (ALC) can precipitate uric acid crystallization and increase the pain symptom of the gouty patients, so the authors also classified them as PRFs. The set of symptoms to be included from the interview included: dyspepsia, back pain, myofascial pain and polyarthralgia. A patient whose symptoms were aggravated after taking any of these foods was considered as having PRF food problems.

Statistical Analysis

Statistical analyses were conducted using SPSS version 11.5 for Windows. The logistic-regression models were used to estimate the odds ratio. The associated 95% confidence intervals (CI) were calculated to express the association between factors and dyspepsia. Chi-squares for linear trend were calculated using the Epi-Info version 6 (Centers for Disease Control and Prevention, Atlanta, Georgia).

Results

A total of 978 subjects were recruited, 489 for each group. For the study (G1) and control group (G2), the percentage of females was 72.2 and 67.7%. A respective 30.7 vs. 33.3 and 58.7 vs. 57.1 percent of the subjects in G1 vs. G2 were 31-45 and >45 years of age. Within a year, most of G1 patients (48.9%) had 4-7 previous visits because of dyspepsia. The dyspepsia symptoms were upper abdominal discomfort (83.8%), pain (27.8%) and heartburn (28%) (Table 1).

Associations between Dyspepsia and Food Problems, Multiple Chronic Health Complaints

A comparison of characteristics between the dyspeptic cases and the controls are presented in Table 2. For comparison, the age groups were divided at 48 years (the median value of age was 48). UD was not significantly associated with sex, headache. Statistically significant variables ($p < 0.001$ by Chi-square test) were: age (>48 years old), problem caused by any PRF, bamboo shoots (BB), fermented rice noodles (FN), beef or insect (B/I), myofascial pain, poly-arthralgia, paresthesia of flank, chronic fatigue, dysuria, pyuria, hematuria, pyuria/hematuria. The statistically significant variable at $p < 0.05$ was back pain.

Among the asymptomatic control patients (G2), the frequency of food problems from any kinds of PRF, BB, FN and beef/insects (BI) was 35.4, 29.0, 13.5 and 8.0 percent. By contrast, the frequency of PRF, BB, FN and B/I in the dyspepsia group (G1) was 85.5, 72.6,

Table 1. Characteristics of the uninvestigated dyspepsia (cases) and the controls (n = 978)

Characteristics		Case (n = 489)	Control (n = 489)	p-value*
Sex	female	353 (72.2)	331 (67.7)	0.132
Age (year)	30 or less	52 (10.6)	47 (9.6)	0.643
	31-45	150 (30.7)	163 (33.3)	
	More than 45	287 (58.7)	279 (57.1)	
Number of visits	2	26 (5.3)		
	3	141 (28.8)		
	4-7	239 (48.9)		
	8-12	56 (11.5)		
	13 or more	27 (5.5)		
Symptoms**	Discomfort	410 (83.8)		
	Heartburn	137 (28.0)		
	Pain	136 (27.8)		

* Chi-Square Tests; ** more than one symptom for each subject

68.1 and 42.7%.

Among persons in G1 and G2, the frequency of myofascial pain, back pain, polyarthralgia, paresthesia and chronic fatigue was 62.0 and 29.4%, 63.2 and 52.4%, 36.4 and 17.8%, 34.2 and 7.2% and 60.1 and 16.6 %. The mean (SD) of the accompanying symptoms in G1 and G2 was 3.3 (1.7) and 3.3 (1.5) symptoms, which represents a significant difference ($p < 0.001$, Student t-test).

A logistic regression model was implemented. The variables of significance ($p < 0.020$) were included. The results of the logistic regression analysis of the statistically significant and variables of interest are presented in Table 3. UD was significantly associated with problems caused by PRFs, chronic fatigue, flank paresthesia, hematuria, myofascial pain, and pyuria. The adjusted odds ratios and 95% confidence intervals (CI) were: 6.67 (4.58, 9.68), 5.06 (3.46, 7.40), 3.98 (2.41, 6.60), 2.97 (2.01, 4.38), 1.91 (1.32, 2.76) and 1.58 (1.01, 2.45). The variables age (>48), sex, dysuria, poly-arthralgia, headache and back pain were not significantly associated with UD by the logistic regression model.

The symptoms aggravated by PRFs in G1 included: dyspepsia (83.2%), back pain (32.5%), myofascial pain (38.4%), polyarthralgia (24.7%) and any symptom (85.5%) (Table 4). Dyspepsia was aggravated by FN in 66.3% of the subjects, BB in 66.1%, beef in 40.9%, ALC in 21.5%, insects in 10.4%, and any PRF in 83.2%. Among the PRFs, BB was the one that most often aggravated abnormal symptoms (72%), followed by FN (68.1%) and beef (42.7%). ALC caused aggravation in 24.5% of G1; the symptoms being dyspepsia (21.5%), back pain (4.5%), myofascial pain (6.5%) and polyarthralgia (4.7%).

Urine Abnormalities and Number of Visits

Among persons in G1, the frequency of dysuria at least once a year was 31.7 vs. 16.2% in G2, which was significantly different ($p < 0.001$) (Table 2). The frequency of pyuria, hematuria, pyuria /hematuria in G1 was 29.7, 44.0 and 54.0% vs. 15.9, 19.0 and 30.0% in G2, respectively (the differences are significant at $p < 0.001$, Chi-square tests).

Subjects in G1 who had more frequent dyspeptic visits also had a higher rate of pyuria (*i.e.*, the frequency of pyuria in subjects with one previous visit was 22.7% while it was 32.2, 35.7 and 40.7% for those with 2-5, 6-10 and $\geq$ 11 previous visits). Table 5 presents the significantly increasing rates of pyuria, hematuria, pyuria/hematuria when the number of previous dyspeptic visits was increased (Chi-square for trend, $p = 0.015, 0.032, 0.023$, respectively).

Hyperechoic foci by ultrasonography

Of the168 subjects in G1 and 489 in G2 scanned by U/S, hyperechoic foci (HYF) were found significantly

Table 2. Bivariate analysis between dyspepsia, food problems, urinary findings and associated symptoms (n = 978)

Variables	Case (489)	Control (489)	p-value*
Age >48	246 (50.3)	205 (41.9.3)	0.009
Sex (female)	353 (72.2)	331 (67.7)	0.143
PRF problem	418 (85.5)	173 (35.4)	<0.001
Bamboo shoot	355 (72.6)	142 (29.0)	<0.001
Fermented noodle	333 (68.1)	66 (13.5)	<0.001
Beef/insect	209 (42.7)	39 (8.0)	<0.001
Myofascial pain	306 (62.6)	144 (29.4)	<0.001
Back pain	309 (63.2)	256 (52.4)	0.001
Poly-arthralgia	178 (36.4)	87 (17.8)	<0.001
Flank paresthesia	167 (34.2)	35 (7.2)	<0.001
Chronic fatigue	294 (60.1)	81 (16.6)	<0.001
Headache	204 (41.7)	176 (36.0)	0.070
Dysuria	155 (31.7)	79 (16.2)	<0.001
Pyuria	145 (29.7)	71 (15.9)	<0.001
Hematuria	215 (44.0)	85 (19.0)	<0.001
Pyuria/Hematuria	264 (54.0)	134 (30.0)	<0.001

* Chi-square test

Table 3. Logistic regression between significant variables and dyspepsia

Symptom/finding	Adjusted Odds Ratio	95% CI
Problems from PRF	6.67	4.58, 9.68
Chronic fatigue	5.06	3.46, 7.40
Flank paresthesia	3.98	2.41, 6.60
Hematuria	2.97	2.01, 4.38
Myofascial pain	1.91	1.32, 2.76
Pyuria	1.58	1.01, 2.45
Dysuria	1.27	0.83, 1.93
Poly-arthralgia	1.40	0.92, 2.14
Sex	0.97	0.66, 1.42
Age > 48	0.78	0.54, 1.11
Headache	0.73	0.51, 1.07
Back pain	0.60	0.41, 0.87

Variable(s) entered on step 1: myofascial pain, sex, problem by PRF, pyuria, hematuria, fatigue, arthritis, dysuria, paresthesia at flank, back pain, headache, age (> 48 years)

higher in G1 (72.0%) than in G2 (30.1%) ($p < 0.001$). Despite the difference in frequency, the distributions of their sizes were similar. Among persons in G1, the frequency of HYF with the diameters ≤ 5.0, 5.1-7.5 and >7.5 mm was 87.6, 8.3 and 4.1 percent. The comparable frequencies in G2 were 87.8, 4.8 and 7.5 percent (Table 6).

Discussion

The present study revealed an association between UD and abnormal findings in the urinary system (*i.e.*, pyuria, hematuria and HYF), history of food problems, and multiple chronic health complaints (MCHC).

Many other studies reported that 50% of UDs were non-ulcer dyspepsia (NUD). The various theories proposed for the cause of NUD included: (1) delayed gastric emptying, (2) gastric hypersensitivity, (3) inflammation, (4) infection (*H. pylori*), (5) acid mucosal damage to dysmotility, and (6) central nervous system (autonomic) dysfunction[7-9]. The pathophysiology of non-ulcer dyspepsia (NUD) is not definitively known[16]. No other reports mentioned an association between NUD and urinary tract infection and PRFs.

The present study showed that the persons with UD who repeatedly visited the community hospital had a high prevalence of pyuria, hematuria and HYF in the kidney. The HYF, which was uric acid sludge or stones, could be the nest of chronic infection. These findings suggest some infection or inflammation in the

Table 4. Aggravated symptoms and the foods in the dyspeptic group (n = 489)

Aggravated symptom Food	Dyp (%)	Bac (%)	Myo (%)	Art (%)	Abn (%)
Fermented noodle	66.3	16.6	15.7	11.5	68.1
Bamboo shoot	66.1	25.4	23.9	18.6	72.6
Beef	40.9	5.3	4.7	5.3	42.7
Alcohol	21.5	4.5	4.3	3.9	24.5
Insects	10.4	6.7	6.5	4.7	16.6
Any of the above	83.2	32.5	38.4	24.7	85.5

Dyp, dyspepsia; Bac, back pain or lower abdominal pain; Myo, myofascial pain; Art, polyarthralgia; Abn, abnormal

Table 5. Pyuria, hematuria and numbers of visit among the dyspepsia group (n = 463)

No. of dyspepsia visits	Wbc		Rbc		Wbc/Rbc	
	+	-	+	-	+	-
2	32	109	53	88	65	76
3-6	77	162	105	134	134	105
7-11	20	36	30	26	34	22
12 or more	11	16	14	13	17	10
p-value (Chi square for trend)	0.015		0.032		0.023	

Table 6. Ultrasonography in the dyspepsia group and the control group

Results of ultrasonography		Case (n = 168)	Control (n = 489)	p-value*
Hyperechoic foci		121 (72.0)	147 (30.1)	<0.001
Size	5.0 mm or less	106 (87.6)	129 (87.8)	0.282
	5.1-7.5 mm	10 (8.3)	7 (4.8)	
	7.6 mm or more	5 (4.1)	11 (7.5)	

* Chi square test

urinary system which induces gastric dysmotility or delayed gastric emptying leading to dyspepsia. Chronic infection of the urinary system can cause systemic responses leading to multiple chronic complaints (*i.e.*, fatigue, back pain and frank paresthesia) concurrent with dyspepsia.

Kunin and co-workers[17] found that in young women, pyuria was present in 19.6% of asymptomatic women and in 77.1% of those with urinary symptoms. To compare with the present study, the pyuria in the control group (15.9%) was similar to that in asymptomatic women, while the pyuria in the UD group (29.7%) was lower than in the group with urinary symptoms (77.1%). The significant differences in the rate of pyuria and hematuria in the UD group (29.7 and 44.0%) and in the control group (15.9 and 19.0%) suggest that dyspepsia in the present study is associated with inflammation or infection of the urinary system.

The present study revealed that PRFs can aggravate symptoms in 85.5% of persons with UD, compared to 35.4% among the control subjects. The present study cannot explain the precise mechanism for aggravation of dyspepsia by these foods, but it was observed that the foods are known to cause pain among the Thai sufferers of gout. There might be a metabolic product very similar to uric acid, which may cause joint pain especially when the patients eat bamboo shoots, beef, insects, fermented food and alcohol. Alcohol can affect uric acid synthesis[18] and inhibit urate secretion[19]. Large amounts of fermented foods can lower body pH which promotes the precipitation of uric acid. Urate crystals then initiate, amplify and sustain an intense inflammatory attack of humoral and cellular inflammatory mediators[20].

Uric acid is eliminated from the body by two main routes; *viz*, enteric secretions and urine excretion. Uric acid in the urine can precipitate leading to uric acid lithiasis under: (1) persistent urine acidity; (2) decreased urine volume; and, (3) hyperuricosuria[21]. Time may be needed to grow a small nidus of uric crystals before it can form sludge (seen as HYF on US) and become a detectable kidney stone (KS). It is accepted that stone sizes less than 5 mm are difficult to diagnose, so misdiagnosis is not uncommon[22].

During the small and undetected phase, which may last for many years, once infected, the KS can serve as a nest of infection and repeated infections may be common. In one study[15], treatment of infected kidney stones with antibiotic and Orthosiphon without any other drug eliminated dyspepsia as well as myofascial pain and arthritis. In another randomized control study on the multiple chronic health complaints (MCHC) without pyuria reported a 50% relief of dyspepsia, myofascial pain, arthralgia and fatigue in both the Orthosiphon group and the control group when 25 PRFs were restricted for 2 weeks[23].

These results raise a number of questions for further study. For example, are the UD in the other parts of Thailand significantly related to consumption of PRFs, pyuria and small kidney stones? Future technical developments are needed for more sensitive, more specific, faster, but yet a low-cost means of diagnosing small stones and complicated urinary tract infection.

Conclusion

In summary, this case-control study revealed an association between repeated, uninvestigated dyspepsia (UD) and purine-rich foods, kidney sludge or stones, urinary tract infection, and multiple chronic health complaints (MCHC). Further studies on the association between non-ulcer dyspepsia (NUD) and urinary tract inflammation should be implemented, especially in countries with a high incidence of gouty arthritis and NUD.

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ปัจจัยเสี่ยงในการรับการรักษาอาการจุกแน่นท้องซ้ำในโรงพยาบาลชุมชนจังหวัดขอนแก่น

อมร เปรมกมล, ศรีน้อย มาศเกษม, อภิสิทธิ์ ธำรงวรางกูล, วิชัย อัศวภาคย์

***ภูมิหลัง**: อาการจุกแน่นท้องเป็นอาการที่พบบ่อย เมื่อทำการตรวจวินิจฉัยจะพบว่ามีแผลในกระเพาะร้อยละ 26.4 และร้อยละ 50 ไม่ทราบสาเหตุ ในภาคอีสานของประเทศไทยมีผู้เป็นนิ่วไตจำนวนมากที่มีการติดเชื้อในทางเดินปัสสาวะ พบว่าผู้ที่มีการติดเชื้อดังกล่าวมักจะมีอาการจุกแน่นท้องเรื้อรัง*

***วัตถุประสงค์**: เพื่อศึกษาความสัมพันธ์ ระหว่างอาการจุกแน่นท้องซ้ำที่ตรวจพบในโรงพยาบาลชุมชนกับการตรวจพบเม็ดเลือดแดง และเม็ดเลือดขาวในปัสสาวะ และปัจจัยอื่นๆ*

***วัสดุและวิธีการ**: ทำการศึกษาแบบ case-control กลุ่มศึกษาคือผู้ป่วยจุกแน่นท้อง ที่มารับการรักษาซ้ำที่โรงพยาบาลชุมชน 3 แห่ง ในจังหวัดขอนแก่น จำนวน 489 ราย และกลุ่มควบคุมสุ่มตัวอย่างมาจากประชากรที่รับการสำรวจความชุกของอาการเจ็บป่วยทั่วไป (Subjective health complaints) ในเขตชนบทของจังหวัดเดียวกัน ทำการวิเคราะห์หาความสัมพันธ์โดยใช้เทคนิค Multivariate logistic regression models*

***ผลการศึกษา**: อาการจุกแน่นท้องสัมพันธ์กับการมีอาการผิดปกติจากอาหารพิวรีนสูง อาการอ่อนเพลียเรื้อรัง การรู้สึกร้อนที่เอว มีเม็ดเลือดแดงในปัสสาวะ อาการปวดเมื่อยกล้ามเนื้อเรื้อรัง และการมีเม็ดเลือดขาวในปัสสาวะ โดยมีค่า adjusted odds ratio (95% CI) เป็น 6.67 (4.58, 9.68), 5.06 (3.46, 7.40), 3.98 (2.41, 6.60), 2.97 (2.01, 4.38), 1.91 (1.32, 2.76) และ 1.58 (1.01, 2.45) ตามลำดับ ไม่พบความสัมพันธ์กับปัจจัยเรื่อง อายุ เพศ การปวดข้อ การปวดศีรษะ การปวดหลัง ระดับของการมีเม็ดเลือดขาว เม็ดเลือดแดงในปัสสาวะ มีความสัมพันธ์กับจำนวนครั้งในการมารับการตรวจใน 1 ปีที่ผ่านมาด้วยโรคนี้ (Chi square for trend, p =0.015, 0.032 ตามลำดับ) อาหารที่ก่ออาการจุกแน่นท้องในกลุ่มศึกษาได้แก่หน่อไม้ ขนมจีน เนื้อสัตว์ เหล้าเบียร์ และแมลง*

***สรุป**: การศึกษานี้พบความสัมพันธ์ระหว่างอาการจุกแน่นท้องกับการมีประวัติผิดปกติเมื่อรับประทานอาหาร พิวรีนสูง การตรวจพบเม็ดเลือดแดง เม็ดเลือดขาวในปัสสาวะ*