Original Article

Food intolerance prevalence in active ulcerative colitis in southwest China

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Background and Objectives: Food intolerance is believed to be a source of frequent medical problems in ulcerative colitis (UC), which closely correlate with patients' dietary pattern. Living in an underdeveloped area of China, residents in southwestern region have diverse dietary habits. The objective of this study is to determine the prevalence of food intolerance in the UC patients in this area and to discuss some of the possible risk factors leading to the condition. **Methods and Study Design:** Food antibodies in serum of 80 patients with active UC were determined by standard enzyme-linked immuno sorbent assay (ELISA). This study examined the risk factors contributing to high titers of food antibodies and the dietary patterns correlating with food intolerance in these demographics. **Results:** 83.8% of patients (67/80) were found to be seropositive for food intolerance. Patients of female, aged between 20 to 40 and the one who tended to have a high fat diet were tested to be highly seropositive ($p<0.05$). Neither spicy food intake nor the course the disease manifested any relationship with the presence of food intolerance ($p>0.05$). **Conclusion**: Active UC patients in southwestern region of China have showed to be high seropositive in food intolerance, particularly in female and young patients. Dietary patterns with high in fat intake seem to have caused high prevalence of seropositivity in food intolerance. Although rice has been taken as staple food and the spicy food has been popular among citizen in this region, these foods have indicated to no effect on food intolerance in this study.

Key Words: food intolerance, ulcerative colitis, seropositive, dietary patterns

INTRODUCTION

Ulcerative colitis (UC) and Crohn's disease (CD) are the two best recognized forms of inflammatory bowel disease (IBD), and UC was characterized by chronic colon and rectum inflammation with relapsing and remitting nature. UC can cause long-term chronic digestive symptoms. However the etiology of UC is considered to be multifactorial. In previous studies, UC has been characterized to have an abnormal mucosal immune response.[1] In other studies, a strong genetic susceptibility, environmental and dietary factors play a major role in UC.[2] Food intolerance has been reported in some UC studies. Saeed et al have found that almost 45% of the healthy population has food intolerance in different degrees and the incidence is higher in babies and children than in adults.[3] In China, the prevalence was reported to be 57.7% in the healthy population.[4] Positive rate of food intolerance in UC patients has been reported to be 80.1%.[5] It seems that different prevalence levels have been detected in different areas of the regions.

Diet has long been considered to be an important factor in the pathogenesis of UC. Dietary beliefs and behavior have a strong impact on patients' social lives.[6] Jowett SL et al reported that dietary beliefs affected by education on food selection could have an adverse effect. For example, patients who avoided dairy products resulted in a significantly lower intake of calcium.[7] This confirms that inappropriate beliefs of food restriction may adversely affect nutrient intake. The southwestern region of China is an underdeveloped area, where most ethnic minorities live with diverse lifestyles, especially in dietary patterns. We had the opportunity to examine the serostatus of food intolerance in active UC patients in this area and to study the possible risk factors.

METHODS

Study population and variables

Patients were tested for the presence of food antibodies while they underwent medical treatment between September 2013 and December 2014 in Affiliated Hospital of Youjiang Medical University for Nationalities. Lactose intolerant patients were ruled out. Patients completed a questionnaire concerning the date and place of birth, eth-

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nicity, time of residency in southwest China, and their history of UC. Their dietary patterns were evaluated with a semi-quantitative food frequency questionnaire (SQFFQ).

Some previous research had reported that some patients with gastrointestinal symptoms have verifiable specific food intolerance, but a part of them have symptoms attributable to psychogenic causes.[7] This study assessed the food intolerance with the objective standard of specific IgG detected by enzyme-linked immunosorbent assay (ELISA). The stage of sero status in food intolerance was categorized as high (IgG ≥200 U/mL), moderate (IgG between 100-200 U/mL), slight intolerance (IgG between 50-100 U/mL) or negative (IgG <50 U/mL). Fourteen commonly home-cooked foods in the southwest of China were detected, including beef/mutton, chicken/duck/goose, codfish/carp/catfish, corn, crab, eggs, mushrooms, milk, pork, rice, shrimp, soybean/peanut/mung bean, tomato/carrot/garlic and wheat. Serum IgG of higher than 50 U/mL were considered as evidence of intolerant seropositive.

Ethical considerations

The aim and method of the research was explained to all patients. They all agreed to participate voluntarily. Subsequently, written informed consent was obtained from all patients prior to the beginning of our study.

Statistical analysis

Comparisons in both seronegative and seropositive group were performed using the Chi-square test. The measurement data was described in ($\overline{X} \pm SD$), $p<0.05$ was considered to be statistically significant.

RESULTS

Demographic and certain hypothetic factors of patients with or without food intolerance are shown in Table 1. A total of 80 UC patients (≥18 years of age) were included in the study. Of these, 48 (60%) were men and 32 (40%) were women. The median age of the patients was 34 years (range, 18-62) and the course of disease was a range of 2-19 (4.8±3.96) years. Most of the patients were born in southwest China (88.8%), but 9 of them (11.3%) were born inother areas of China. However, they all lived in southwest of China for a period of no less than 10 years.

The dietary patterns were categorized by the kind of staple food, high fat diet and spicy diet. According to the analysis of SQFFQ evaluated results, most patients (91%) eatrice as their staple food, 76% of patients eat high fat diet and 75% tended to eat spicy foods frequently. Significant differences were found in sex, age and high fat dietary patterns ($p<0.05$). Self-reported histories of disease, a dietary pattern of spicy food and eating rice as staple food were not significantly associated with serum status offood intolerance.

The seropositive rate including 3 levels of intolerance accounted for 83.8 % (67/80). Patients with high intolerance level occupied 21.3% (17/80), 32.5% (26/80) of patients were moderate seropostitive and 30% (24/80) were slightly seropositive. Among 67 seropositive patients, 89.6% (60/67) had no clued of food intolerance before the examination.

Fourteen kinds of intolerance food items are given in Table 2. Eggs, shrimp, milk, wheat and crab were shown to be seropositive obviously. In addition, nearly one-third of patients (32.5%) were intolerant toonly one kind of food. In high and moderate patients, intolerance to two or more different foods was observed, and most were intolerant to eggs, milk, crab and beef/mutton.

Since the statistics for serum status of food intolerance were shown by sex and age in Table 1. Subsequent analyses were carried out separately for the two genders and age stages. In 8 out of 14 foods, detected seropositive IgG were higher in women than in men, and it was significant in eggs, milk, wheat, beef/mutton and chicken/duck/goose (Table 3, $p<0.05$). There was no statistical significance in other 4 kinds of food.

Age of patients participated in this study ranged 18 to 62. According to UC characteristic incidence age in China, they were divided into 3 groups (≤20 y, 20-40 y, ≥40 y). Patients aged 20 to 40 had the highest IgG of eggs, shrimp and mushrooms, which was statistically significant among the groups (Table 4, $p<0.05$). There was no statistical significance for other kinds of food.

DISCUSSION

While food intolerance is not the main cause of UC, it remains a potential risk for a series of digestive symptoms,

Table 1. Risk factors associated with food intolerance in active UC patients as determined by ELISA

Variable (n)	Food intolerance serostatus		χ^2	p
	Seronegative (n=13)	Seropositive (n=67)		
Sex				
Men	9	23	5.53	0.019
Women	4	44		
Age (years)				
18-20	1	16		
20-40	7	35	7.18	0.028
40-62	7	12		
Course of disease (years)				
<5	2	8		
5-10	8	44	2.26	0.323
10-20	3	5		
Diet pattern (yes/no)				
Take rice as staple food	11/2	62/5	0.856	0.355
High fat diet	7/6	54/13	4.30	0.038
Spicy food	9/5	51 /15	1.04	0.308

Table 2. Fourteen kinds of food' intolerance in active UC patients

Food	IgG (mean±SD)	Patients			Overall	%
		High	Moderate	Slight		
Egg	134±22.0	8	6	16	30	37.5
Shrimp	90.8±26.3	12	6	2	20	25.0
Milk	89.9±19.6	8	4	3	15	18.8
Wheat	87.9±17.6	8	3	3	14	17.5
Crab	70.2±20.1	6	4	1	11	13.8
Rice	49.6±11.6	8	2	0	10	12.5
Soybean/peanut/mung bean	45.8±12.2	8	2	0	10	12.5
Beef/mutton	30.4±17.6	7	2	1	10	12.5
Codfish/carp/catfish	23.9±12.1	5	3	1	9	11.3
Corn	29.0±9.32	6	3	0	9	11.3
Chicken/duck/goose	28.1±8.46	5	4	0	9	11.3
Mushroom	17.5±7.56	5	2	0	7	8.75
Pork	15.5±7.02	4	3	0	7	8.75
Tomato/carrot/garlic	14.3±6.86	3	3	0	6	7.50

Table 3. Analyses of food intolerance in different sex group

Food	IgG (U/mL)		*p*
	Men (mean±SD)	Women (mean±SD)	
Egg	95.3±13.5	169±23.1	0.012
Milk	70.3±18.0	96.2±19.3	0.031
Wheat	60.8±9.45	89.3±14.3	0.019
Beef/mutton	23.5±7.42	31.8±7.33	0.021
Chicken/duck/goose	21.3±8.19	32.3±11.2	0.031

Table 4. Analyses food intolerance in different age group

Food	IgG (U/mL) (mean±SD)			*p*
	≤20y (n=17)	20-40y (n=43)	≥40y (n=20)	
Egg	96.3±23.2	242±20.6	40.6±21.0	0.034
Shrimp	26.7±7.12	87.7±6.82	34.2±7.19	0.021
Mushroom	2.36±1.09	17.4±6.32	11.8±5.12	0.033

causing the treatment become complicated and resulting in malnutrition in these patients.[8,9] Food intolerance rate in IBD patients is reported to be 80.4% in a study of food intolerance in patients with common digestive system diseases.[10] Although antibodies to food are normal, this study indicates that the prevalence of serostatus food intolerance in UC patients in southwestern of China shown to have higher prevalence rate (83.8%). This is a reminder to health professionals to pay attention to food intolerance in UC treatment.

As it is shown in Table 2, eggs, shrimp and milk obviously had high seropositive levels in active UC patients. These kinds of foods are high in protein, especially for eggs. We deduced that this relates to eating egg and shrimp frequently in southwest China. On the other hand, the protein included in eggs and shrimp is very strong immunogenicity. However, it is not necessary that patients avoid all kinds of protein foods (some of our patients are too extreme in avoiding any food which rich in protein). Thus, examination and health education on food dietary patterns are necessary.

As shown in Table 3, female patients had a higher seropositve IgG than men in most foods. Similar findings have been described in other studies in the general population,[4] as well as in patients with UC.[5] We attribute it to women's special immune environment. Due to the regulation of neuroendocrine system, women have a stronger immune reaction than men, and also have a higher incidence of autoimmune disease,[11] which might cause a higher incidence of food intolerance. This prevalence is obvious in this study.

Food intolerance can be found in any age. As shown in this study, patients between 20 to 40 years of age have an obviously higher sero status IgG than those who are younger than 20 or older than 40 years. Our finding is different from other studies which found that the incidence of food intolerance is higher in children and elderly in health population.[12] We account that for the age of onset in UC. Demographic studies revealed that men aged 20 to 24 years and women aged 25 to 29 years have the highest incidence of UC around the world. However, the reported highest incidence age of UC was 30 to 39 years in China, followed by 40 to 49 years group and the incidence decreased in population of older than 60 years.[13] There has been no documented information about age of onset in southwest of China. Considering the age of onset in China, the age categories which had high serum IgG also coincides with the high age of onset, and also provides a strong evidence of relationship between food intolerance and UC activity. Since the youngest patient participated in our study is 18 years old, this conclusion does not include the childhood age group.

Southwest residents have special dietary patterns different from those inother areas of China. For the suitable rice-growing environment, residents in this area eat rice as staple food. Most residents prefer spicy food to adapt to the damp climate. Even so, we found that both of these dietary patterns were not significantly associated withfood intolerance in this study. The course of disease plays an important role in disease development and prognosis.[14,15] However, self-reported histories of disease suggest that it also has no influence in serostatus of food intolerance. With the evaluation of SQFFQ, most of UC patients (76.3%) have shown to have a high fat diet be-

fore being diagnosed with UC. As it is shown in this study, high fat diet do make significant differences between seronegative and seropositve group. In previous research, there is close relationship between UC and obesity. The status of obesity has been reported to be aggravating factors with increased inflammation in the colon and adipose tissue along with systemic alterations.[16] Our results demonstrated a similar relationship between the high fat diet and UC, which highlights the importance of diet guidelines in UC treatment.

Ignorance of food intolerance associated with UC has been a potential concern in our present study. 89.6% of seropositive patients have no clued of their food intolerance before examination, and they have never made any diet adjustment. This is totally different from reports in other developed areas where healthcare professionals focus on the inappropriate dietary restraint of the patients, and its affect on nutritional imbalance.[17] Thus, there is much more work to do to improve the health education for UC patients in this underdeveloped area.

While the ELISA is highly sensitive, especially for measurement of antibodies at low levels; food intolerance should be put in perspective. Notably, symptoms of food intolerance differ from allergic reactions, and it does not mean that patients have to avoid special diet for lifelong span. A dietary rotation plan would be helpful in balancing the patients' nutrient status. Inappropriate beliefs of diet restraint do adversely affect nutrient intake. The health professionals should prescribe an appropriate diet guideline based on the patient's individual condition.

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AUTHOR DISCLOSURES

No competing interests are reported.

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中国西南地区急性溃疡性结肠炎患者食物不耐受流行情况

背景与目的：溃疡性结肠炎与患者的饮食模式密切相关，食物不耐受被认为是溃疡性结肠炎患者频繁就医的原因。生活在中国欠发达地区，中国西南地区居民有着不同的饮食习惯。本研究的目的是确定中国西南地区急性溃疡性结肠炎患者食物不耐受的患病率，并探讨导致该情况的可能危险因素。**方法与研究设计：**运用酶联免疫法检测 80 名急性期溃疡性结肠炎患者血清特定食物抗体水平，通过调查问卷获取患者饮食模式及人口学资料并分析。**结果：**本研究 83.8%（67/80）患者食物不耐受检测阳性，年龄介于 20 至 40 岁倾向于高脂饮食的女性患者血清食物抗体水平明显高（p<0.05），主食种类、辛辣饮食、病史等因素组间差别无统计学意义（p>0.05）。**结论：**中国西南地区急性溃疡性结肠炎患者食物不耐受阳性率高，尤以女性及中青年患者明显。高脂饮食模式与食物不耐受显著相关。本研究未发现桂西地区以大米为主食、喜食辛辣等饮食习惯与患者食物不耐受情况有明显联系。

关键词：食物不耐受、溃疡性结肠炎、血清阳性、饮食模式