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## Observational Study

## Knowledge, attitude, and practice of patients living with inflammatory bowel disease: A cross-sectional study

Xiao-Xiao Shao, Lu-Yan Fang, Xu-Ri Guo, Wei-Zhong Wang, Rui-Xin Shi, Dao-Po Lin

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Patients with inflammatory bowel diseases (IBDs) generally have poor knowledge, attitude, and practice of their disease, while the data from China are lacking.

**AIM**

To address this knowledge disparity among Chinese patients with IBD.

**METHODS**

This web-based, cross-sectional study was conducted on a cohort of IBD patients who visited the Second Affiliated Hospital of Wenzhou Medical University between December 2022 and February 2023. Their socio-demographic information and the knowledge, attitude, and practice scores were collected and estimated using a self-designed questionnaire. Pearson's correlation analysis was used to determine the pairwise correlations among knowledge, attitude, and practice scores. A multivariate logistic regression analysis was further performed to determine the independent factors associated with their knowledge, attitude, and practice scores.

**RESULTS**A total of 353 patients (224 males) with IBD completed the questionnaires. The mean knowledge, attitude, and practice scores were  $10.05 \pm 3.46$  (possible range: 0-14),  $41.58 \pm 5.23$  (possible range: 0-56),  $44.20 \pm 7.39$  (possible range: 0-56), respectively, indicating good knowledge, positive attitude, and proactive practice toward IBD. Pearson's correlation analysis showed that the knowledge score had significant positive correlations with the attitude score ( $r = 0.371$ ,  $P < 0.001$ ) and

practice score ( $r = 0.100$ ,  $P < 0.001$ ). The attitude score had a significant positive correlation with the practice score ( $r = 0.452$ ,  $P < 0.001$ ). Moreover, multivariate logistic regression analysis showed that aged 30-40 years [odds ratio (OR) = 4.06, 95% confidence interval (CI): 1.04-15.82,  $P = 0.043$ ], middle school education (OR = 3.98, 95% CI: 1.29-12.33,  $P = 0.017$ ), high school/technical secondary school education (OR = 14.06, 95% CI: 3.92-50.38,  $P < 0.001$ ), and junior college/bachelor's degree and above education (OR = 15.20, 95% CI: 4.15-55.650,  $P < 0.001$ ) were independently associated with good knowledge. The higher knowledge score was independently associated with a positive attitude (OR = 1.23, 95% CI: 1.11-1.36,  $P < 0.001$ ). The higher attitude score was independently associated with proactive practice (OR = 1.20, 95% CI: 1.11-1.30,  $P < 0.001$ ).

## CONCLUSION

Chinese patients with IBD might have good knowledge, a positive attitude, and proactive practice toward their disease. However, a small number of specific items require education.

**Key Words:** Attitude; Cross-sectional study; Inflammatory bowel disease; Knowledge; Practice; Questionnaire

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**Core Tip:** To address this knowledge disparity among Chinese patients with inflammatory bowel disease (IBD), a web-based, cross-sectional study was conducted on 353 IBD patients (224 males). Their mean knowledge, attitude, and practice scores were  $10.05 \pm 3.46$  (range: 0-14),  $41.58 \pm 5.23$  (range: 0-56), and  $44.20 \pm 7.39$  (range: 0-56), respectively. Multivariate logistic regression analysis showed that age and education were independently associated with knowledge. Knowledge was independently associated with attitude. The attitude was independently associated with the practice. In conclusion, patients with IBD in China might have good knowledge, a positive attitude, and proactive practice toward their disease. However, some specific items require education.

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## INTRODUCTION

Inflammatory bowel disease (IBD) is a chronic, non-specific inflammation of the gastrointestinal tract, including ulcerative colitis and Crohn's disease. The IBD usually develops before age 30[1-3]. Moreover, IBD is associated with a poor quality of life and may increase colorectal cancer risk[2-4]. The individual management strategy of IBD is tailored to each patient according to diagnosis, disease activity grade, disease lesion, and personal prognostic factors[1,3-7]. Despite this, IBD continues to be difficult to manage, as treatment adverse effects and repeated exacerbation/recurrence episodes can eventually necessitate costly second-line therapies or even surgery[8-11].

Maintaining proper lifestyle habits is necessary and complementary to medical treatments in patients with IBD[12,13]. Fundamental to patient self-management is knowing which foods and situations to avoid and what can be done to alleviate symptoms[12,13]. To implement adequate self-management, a thorough understanding of IBD causes, risk factors for exacerbation/recurrence, disease mechanisms, and treatments is essential, and this knowledge needs to be translated into more effective (but not infallible) self-management. In addition, since there is no cure for IBD, self-management is essential to its treatment[1,5,14]. Indeed, since the management of IBD necessitates the adoption of healthy lifestyle habits, IBD patients are the first to be accountable for their health[12,13], which requires proper knowledge, attitudes, and practice (KAP) of the specific lifestyle routines to implement. The appropriate KAP about IBD can reduce medical acceleration in patients with IBD[15]. Since the 1990s, however, some studies have revealed that patients with IBD have misconceptions and limited knowledge of their disease[16-21]. Such studies are important to identify the gaps in knowledge that represent barriers to the proper management of IBD. Identifying these obstacles could also aid in designing interventions to enhance or rectify knowledge[22,23]. Owing to significant differences in culture, economy, health literacy, healthcare systems, and government policies, KAP data are usually very specific to a given population. Of note, data about the KAP toward IBD in Chinese patients with IBD are lacking.

The KAP methodology provides quantitative and qualitative data on the misconceptions that could represent obstacles to a specific task/subject in a specific population[22,23]. Hence, this study aimed to investigate the KAP of patients with IBD toward their disease in Zhejiang Province, China. The results could help healthcare providers to improve the patient's self-management of IBD.

## MATERIALS AND METHODS

### Study design and participants

It was a cross-sectional study conducted on patients with IBD at the Second Affiliated Hospital of Wenzhou Medical University using convenience sampling. Our study was approved by the ethics committee of the same hospital (approval No. 2022-K-184-02). Each patient provided written informed consent before completing the survey.

### Procedures

The questionnaire was designed with reference to the World Gastroenterology Organization Practice Guidelines for the Diagnosis and Management of IBD in 2010[24] and the clinical nutrition guideline for IBD by the European Society for Clinical Nutrition and Metabolism in 2016[25]. Then, the questionnaire was submitted to 5 experts for review. After the modifications based on their comments, a small-scale validation was performed (33 copies), showing a Cronbach's  $\alpha$  of 0.854.

The final questionnaire was in Chinese patients with IBD and included four dimensions with 62 items. Among them, the socio-demographic information dimension consisted of 20 items. The knowledge, attitude, and practice dimensions consisted of 14 items each. The items in the knowledge dimension were scored 1 point for a correct answer and 0 points for a wrong or unclear answer (total score of 0-14). The options from positive to negative (*e.g.*, 4 to 0) were assigned for the attitude and practice dimension. The total scores were 0-56 for the attitude dimension and 0-56 for the practice dimension. The threshold for good knowledge, positive attitude, and proactive practice was  $\geq 70.0\%$ .

The questionnaires were administered to the participants through WeChat on the SoJump platform (<https://www.wjx.cn/app/survey.aspx>). A given IP address could be used to submit a questionnaire only once. All items must be answered before the submission of the questionnaire. Questionnaires that took less than 2 min to complete or with obvious filling patterns were excluded.

### Statistics analysis

All analyses were performed using Stata 17.0 (Stata Corporation, College Station, TX, United States). The normal distribution of continuous data was checked using the Kolmogorov-Smirnov test. Those continuous data conforming to the normal distribution were presented as means  $\pm$  SD and analyzed using Student's *t*-test (two groups) or ANOVA (more than two groups). Otherwise, they were presented as medians (ranges) and analyzed using the Wilcoxon-Mann-Whitney *U*-test (two groups) or the Kruskal-Wallis analysis of variance (more than two groups). Categorical data were displayed as numbers (percent). Pearson's correlation analysis was used to determine the pairwise correlations among KAP scores. A multivariate logistic regression analysis was performed to determine the independent factors relevant to the KAP score. Variables with *P*-values less than 0.20 in the univariate analysis were included in the multivariate logistic analysis. Two-sided *P*-values below 0.05 were regarded as statistically significant.

## RESULTS

The present study included a total of 353 valid questionnaires. Most of the participants were male (63.5%), aged 20-30 (32.9%) years. The other social-demographic data are presented in Table 1. The mean knowledge, attitude, and practice scores were  $10.05 \pm 3.46$  (possible range: 0-14),  $41.58 \pm 5.23$  (possible range: 0-56), and  $44.20 \pm 7.39$  (possible range: 0-56), respectively, indicating good knowledge, positive attitude, and proactive practice toward IBD (Table 1).

The knowledge items with the lowest score were K2 (21.0%, "At present, and many factors such as heredity, immunity, environment, and microorganisms are involved in the pathogenesis of the disease"), K11 (42.2%, "There are no side effects under the therapy of glucocorticoids, *etc.*"), K4 (60.1%, "Extraintestinal manifestations of IBD include oral ulcers, joint injury, skin injury, eye lesions, hepatobiliary diseases, *etc.*"), and K13 (65.7%, "All patients with IBD cannot normally absorb the nutrients they intake") (Table 2). The attitude item with the lowest score was A8 ("I think that treatment can be stopped when the colonoscopy shows mucosal healing *i.e.*, complete healing of colonic erosions and ulcers") (Table 3). The practice item with the lowest score was P11 ("I will use a diet diary to identify foods that may cause discomforts such as abdominal pain or diarrhea and try to avoid them in my future diet"). In addition, 98.0% of the participants were willing to stop smoking and drinking (Table 4).

The knowledge score was found to be related to the attitude score ( $r = 0.371$ ,  $P < 0.001$ ) and practice ( $r = 0.100$ ,  $P < 0.001$ ) score, respectively. The attitude score was related to the practice score ( $r = 0.452$ ,  $P < 0.001$ ) (Table 5). Moreover, multivariate logistic regression analysis suggested that aged 30-40 years [odds ratio (OR) = 4.06, 95% confidence interval (CI): 1.04-15.82,  $P = 0.043$ ], middle school education (OR = 3.98, 95%CI: 1.29-12.33,  $P = 0.017$ ), high school/technical secondary school education (OR = 14.06, 95%CI: 3.92-50.38,  $P < 0.001$ ), and junior college/bachelor's degree and above education (OR = 15.20, 95%CI: 4.15-55.650,  $P < 0.001$ ) were independently linked with the knowledge score (Table 6). The knowledge score (OR = 1.23, 95%CI: 1.11-1.36,  $P < 0.001$ ) was independently associated with the attitude score (Table 7). In addition, the attitude score (OR = 1.20, 95%CI: 1.11-1.30,  $P < 0.001$ ) had an independent effect on the practice score (Table 8).

Table 1 Characteristics of the participants

Variables	n (%)	Knowledge		Attitude		Practice	
		mean $\pm$ SD	P value	mean $\pm$ SD	P value	mean $\pm$ SD	P value
Total	353	10.05 $\pm$ 3.46		41.58 $\pm$ 5.23		44.20 $\pm$ 7.39	
Gender			0.468		0.830		0.077
Male	224 (63.5)	9.95 $\pm$ 3.57		41.62 $\pm$ 5.02		44.72 $\pm$ 7.35	
Female	129 (36.5)	10.2 $\pm$ 3.28		41.50 $\pm$ 5.59		43.28 $\pm$ 7.40	
Age, yr (10 cases missing)			< 0.001		0.142		0.886
$\leq$ 20	41 (11.6)	9.46 $\pm$ 3.87		40.95 $\pm$ 5.13		44.00 $\pm$ 8.15	
20-30	116 (32.9)	10.87 $\pm$ 2.94		42.41 $\pm$ 5.25		44.37 $\pm$ 7.40	
30-40	85 (24.1)	10.56 $\pm$ 3.03		41.81 $\pm$ 5.24		43.89 $\pm$ 6.92	
> 40	101 (28.6)	9.02 $\pm$ 3.91		40.88 $\pm$ 5.21		44.70 $\pm$ 7.27	
Ethnicity (1 case missing)			0.011		0.028		0.609
Han	341 (96.6)	10.13 $\pm$ 3.39		41.69 $\pm$ 5.16		44.25 $\pm$ 7.41	
Minorities	11 (3.1)	7.45 $\pm$ 4.89		38.18 $\pm$ 6.51		43.09 $\pm$ 6.85	
Residence			0.006		0.059		0.002
Rural	149 (42.2)	9.38 $\pm$ 3.72		44.18 $\pm$ 5.19		43.76 $\pm$ 7.76	
City	122 (34.6)	10.66 $\pm$ 3.05		42.48 $\pm$ 5.05		45.97 $\pm$ 6.73	
Suburb/urban-rural combination	82 (23.2)	10.35 $\pm$ 3.85		40.95 $\pm$ 5.45		42.35 $\pm$ 7.13	
Education			< 0.001		0.003		0.089
Primary school and below	25 (7.1)	6.92 $\pm$ 3.53		40.00 $\pm$ 4.97		42.88 $\pm$ 7.21	
Middle school	67 (19.0)	7.99 $\pm$ 4.17		39.99 $\pm$ 5.82		42.40 $\pm$ 8.01	
High school/technical secondary school	84 (23.8)	10.25 $\pm$ 2.88		41.42 $\pm$ 4.83		44.55 $\pm$ 6.98	
Junior college/bachelor's degree and above	177 (50.1)	11.18 $\pm$ 2.75		42.47 $\pm$ 5.05		44.89 $\pm$ 7.29	
Work status			< 0.001		0.002		0.012
Employed	185 (52.4)	10.79 $\pm$ 2.96		42.39 $\pm$ 4.90		45.13 $\pm$ 6.83	
Other	168 (47.6)	9.23 $\pm$ 3.78		40.68 $\pm$ 5.44		43.17 $\pm$ 7.85	
Monthly per capita income			< 0.001		0.003		0.074
< 5000	173 (49.0)	9.32 $\pm$ 3.87		40.61 $\pm$ 5.20		43.29 $\pm$ 7.95	
5000-10000	104 (29.5)	10.88 $\pm$ 2.52		42.37 $\pm$ 4.96		45.21 $\pm$ 6.59	
> 10000	76 (21.5)	10.55 $\pm$ 3.27		42.68 $\pm$ 5.32		44.87 $\pm$ 6.93	
Marital status			0.029		0.939		0.201
Unmarried or other	157 (44.5)	10.50 $\pm$ 3.21		41.60 $\pm$ 5.25		44.76 $\pm$ 7.40	
Married	196 (55.5)	9.69 $\pm$ 3.62		41.56 $\pm$ 5.23		43.74 $\pm$ 7.37	
Smoking habit			0.163		0.386		0.202

No (no smoking)	282 (79.9)	10.18 ± 3.33		41.45 ± 5.13		43.94 ± 7.18	
Yes (smoking or used to smoke)	71 (20.1)	9.54 ± 3.92		42.06 ± 5.63		45.20 ± 8.14	
Drinking habit			0.461		0.744		0.372
No (no drinking)	240 (68.0)	10.14 ± 3.40		41.51 ± 5.27		43.95 ± 7.36	
Yes (drinking or used to drink)	113 (32.0)	9.85 ± 3.59		41.71 ± 5.16		44.71 ± 7.47	
Medical insurance type (multiple choices)							
Basic medical insurance for urban employees	187 (53.0)	10.68 ± 3.06	< 0.001	43.62 ± 4.98	< 0.001	44.79 ± 7.14	0.108
New cooperative medical insurance	112 (31.7)	9.16 ± 4.02	0.001	54.18 ± 5.45	0.001	43.34 ± 7.88	0.138
Basic medical insurance for urban residents	62 (17.6)	9.18 ± 3.77	0.029	55.13 ± 4.87	0.460	44.56 ± 6.71	0.666
Commercial insurance	23 (6.5)	10.74 ± 3.37	0.323	56.30 ± 4.76	0.490	45.61 ± 7.24	0.343
No insurance	3 (0.8)	12.33 ± 1.15	0.252	52.00 ± 4.58	0.235	34.67 ± 9.29	0.025
Which IBD			< 0.001		0.005		0.553
Ulcerative colitis	133 (37.7)	9.16 ± 3.69		54.57 ± 5.06		43.89 ± 7.55	
Crohn's disease	220 (62.3)	10.59 ± 3.21		56.18 ± 5.25		44.38 ± 7.30	
Duration of IBD			0.995		0.948		0.248
< 1 yr	239 (67.7)	10.05 ± 3.46		55.58 ± 5.17		44.65 ± 7.36	
1-2 yr	59 (16.7)	10.08 ± 3.43		55.41 ± 5.30		43.17 ± 7.72	
> 2 yr	55 (15.6)	10.02 ± 3.56		55.73 ± 5.59		43.33 ± 7.09	
Ostomy			0.014		0.088		0.621
Yes	27 (7.6)	8.48 ± 4.37		53.93 ± 5.95		43.52 ± 10.05	
No	326 (92.4)	10.18 ± 3.53		55.71 ± 5.15		44.25 ± 7.14	
Comorbidities			0.463		0.064		0.004
Yes	59 (16.7)	9.75 ± 3.72		54.42 ± 5.11		41.71 ± 7.32	
No	294 (83.3)	10.11 ± 3.41		55.81 ± 5.23		44.64 ± 7.28	
Family history of IBD			0.588		0.991		0.392
Yes	9 (2.5)	10.67 ± 4.21		55.56 ± 4.98		42.11 ± 6.43	
No	344 (97.5)	10.03 ± 3.45		55.58 ± 5.24		44.25 ± 7.41	
Surgical history			0.340		0.487		0.894
Yes	165 (46.7)	10.24 ± 3.39		55.78 ± 5.10		44.14 ± 7.47	
No	188 (53.3)	9.88 ± 3.53		55.39 ± 5.35		44.24 ± 7.34	
History of drug allergy			0.110		0.120		0.890
Yes	48 (13.6)	10.79 ± 2.73		56.67 ± 5.15		44.33 ± 7.36	
No	305 (86.4)	9.93 ± 3.55		55.40 ± 5.23		44.17 ± 7.41	
What kind of treatment is being received?			0.040		0.004		0.276
5-aminosalicylic acid drugs (e.g., mesalazine)	19 (5.4)	8.63 ± 3.44		55.00 ± 4.99		45.32 ± 8.87	

Glucocorticoids	1 (0.3)	12.00	57.00	50.00
Immunosuppressants ( <i>e.g.</i> , azathioprine, tacrolimus, cyclosporine, <i>etc.</i> )	6 (1.7)	6.50 ± 3.27	51.33 ± 6.38	37.83 ± 9.99
Biological agents ( <i>e.g.</i> , infliximab, vedolizumab, ustekinumab)	301 (85.3)	10.16 ± 3.49	55.97 ± 5.13	44.33 ± 7.26
Biological agents + immunosuppressants	14 (4.0)	9.93 ± 3.34	51.36 ± 5.58	43.57 ± 6.73
Biological agents + 5-aminosalicylic acid drugs	12 (3.4)	11.25 ± 1.48	53.42 ± 4.36	42.50 ± 6.99

IBD: Inflammatory bowel disease.

**Table 2 Knowledge dimension, *n* (%)**

Knowledge	Correct	Wrong	Unclear
IBD is a group of chronic, non-specific recurrent intestinal inflammatory diseases, including UC and CD	316 (89.5)	2 (0.6)	35 (9.9)
At present, many factors, such as heredity, immunity, environment, and microorganisms, are involved in the pathogenesis of the disease	74 (21.0)	185 (52.4)	94 (26.6)
Symptoms of IBD can include abdominal pain, diarrhea, bloody stool, anemia, fever, joint swelling, pain, <i>etc.</i>	293 (83.0)	13 (3.7)	47 (13.3)
Extraintestinal manifestations of IBD include oral ulcers, joint injury, skin injury, eye lesions, hepatobiliary diseases, <i>etc.</i>	212 (60.1)	32 (9.1)	109 (30.9)
IBD often occurs in young adults and is more common between the ages of 20-50 yr	267 (75.6)	16 (4.5)	70 (19.8)
IBD is a lifelong disease, and the patient's condition is prolonged and repeated. At present, there is no specific and effective medicine or method to cure the disease	293 (83.0)	11 (3.1)	49 (13.9)
Colonoscopy and mucosal biopsy are the best methods to establish the diagnosis and assess the disease's severity in patients with IBD	285 (80.7)	6 (1.7)	62 (17.6)
Generally, medical treatment is the main treatment for IBD, but surgical treatment is needed when intestinal obstruction, intestinal perforation, and canceration occur	275 (77.9)	5 (1.4)	73 (20.7)
The treatment of patients with IBD varies widely among individuals, with different classifications and severity of the disease leading to different treatment outcomes and efficacy	299 (84.7)	1 (0.3)	53 (15.0)
Drugs for treating IBD include hormones, aminosalicylic acid drugs, immunosuppressants (azathioprine, methotrexate, <i>etc.</i> ), and biological agents	274 (77.6)	5 (1.4)	74 (21.0)
There are no side effects after treatment with glucocorticoids, <i>etc.</i>	149 (42.2)	39 (11.0)	165 (46.7)
Currently, the biological agents approved for treating IBD in China include infliximab, vedolizumab, and ustekinumab	292 (82.7)	6 (1.7)	55 (15.6)
All patients with IBD can't normally absorb the nutrients they intake	232 (65.7)	60 (17.0)	61 (17.3)
Emotion, smoking, drinking, and other behaviors will not affect IBD	286 (81.0)	36 (10.2)	31 (8.8)

IBD: Inflammatory bowel disease; UC: Ulcerative colitis; CD: Crohn's disease.

## DISCUSSION

The findings of our study suggested that Chinese patients with IBD had good knowledge, positive attitudes, and proactive practice toward their disease. Nevertheless, some specific items warranting more education were identified. These outcomes may be useful for the management and self-management of IBD patients in clinical practice.

Several studies revealed misconceptions and relatively poor knowledge in patients with IBD about their disease[16-21]. A study from England published 30 years ago already acknowledged that patients with IBD had poor knowledge regarding their disease but were willing to acquire information[16]. More contemporary data indicated little progress since then, *i.e.*, that the knowledge of patients with IBD toward their disease was poor[17-21], including in New Zealand [17], Canada[18], Israel[19], Poland[20], and South Korea[21]. Surprisingly, in the present study, the patients with IBD showed good KAP toward IBD, but it could be noted that most participants had a junior college/bachelor's degree and above education and were receiving expensive biological agents, thereby suggesting a higher socioeconomic status that could influence the results.

**Table 3** Attitude dimension, *n* (%)

Attitude	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I am confident in the treatment of IBD	158 (44.8)	134 (38.0)	58 (16.4)	3 (0.8)	0
I think patients with IBD need to avoid certain foods	186 (52.7)	144 (40.8)	22 (6.2)	1 (0.3)	0
I think that patients with IBD combined with malnutrition need to use a combination of intestinal and extra-intestinal nutrition support according to the disease situation if necessary	171 (48.4)	151 (42.8)	29 (8.2)	1 (0.3)	1 (0.3)
I think scientific dietary guidance and management are key to managing IBD	193 (54.7)	141 (39.9)	18 (5.1)	1 (0.3)	0
I think developing a specific treatment plan for IBD needs to be tailored to the individual's situation and developed jointly by the IBD medical specialist and the patient	208 (58.9)	129 (36.5)	15 (4.2)	1 (0.3)	0
I think the adjustment of IBD medication needs to be carried out under the guidance of specialists, and patients should not adjust their own medication	228 (64.6)	112 (31.7)	13 (3.7)	0	0
I believe that during IBD medication, patients need to monitor the side effects of their medication and provide timely feedback to their specialists	216 (61.2)	128 (36.3)	9 (2.5)	0	0
I think treatment can be stopped when the colonoscopy shows mucosal healing ( <i>i.e.</i> , complete healing of colonic erosions and ulcers)	37 (10.5)	47 (13.3)	92 (26.1)	134 (38.0)	43 (12.2)
I think the early application of biologics, in conjunction with specialist advice, will allow early control of disease activity to change the course of the disease and minimize complications and disability in the bowel	171 (48.4)	147 (41.6)	30 (8.5)	3 (0.8)	2 (0.6)
I think patients with IBD should reduce their intake of saturated fatty acids (animal oil, cream, fatty meats, meat soups, <i>etc.</i> )	137 (38.8)	156 (44.2)	52 (14.7)	7 (2.0)	1 (0.3)
I think that IBD patients should try to drink plain hot water and freshly squeezed juices and need to avoid strong tea, sugary drinks, coffee, alcohol, <i>etc.</i>	177 (50.1)	148 (41.9)	24 (6.8)	2 (0.6)	2 (0.6)
I think the IBD disease has obviously increased the family's financial burden	172 (48.7)	133 (37.7)	42 (11.9)	5 (1.4)	1 (0.3)
I think I can get married, get pregnant, and give birth normally if my IBD disease is controlled	125 (35.4)	166 (47.0)	52 (14.7)	8 (2.3)	2 (0.6)
I think IBD has affected my normal work, study, and social interaction	98 (27.8)	134 (38.0)	86 (24.4)	30 (8.5)	5 (1.4)

IBD: Inflammatory bowel disease.

The present investigation also demonstrated that age and educational attainment were independently associated with knowledge scores. Specific knowledge items that need improvement include the etiology of IBDs, the possible extra-intestinal manifestations of IBDs, the side effects of glucocorticoids, and nutrient absorption. Even though the other knowledge items had high scores, none scored above 90%, indicating they would benefit from additional instruction. Furthermore, knowledge was the only factor independently associated with the attitude score, and attitude was the only factor independently connected with the practice score. Hence, improving the knowledge of patient about IBDs should enhance their KAP. Since a proper KAP of IBDs has been associated with better IBD outcomes[15], improving the KAP can improve patient outcomes, given that self-management is at the core of IBD management[12,13].

Still, patients obtain knowledge primarily from available resources (books, the internet, newspapers, *etc.*), their social network, and healthcare professionals. A study highlighted variable access to high-quality information on IBD-related nutrition[26], and nutrition is a major factor influencing the intestinal microflora and the outcomes of IBDs[27-29]. Furthermore, a study in New Zealand showed that the KAP of IBD in the general population was also low[30,31], suggesting that patient education is deficient or ineffective since the patients with IBD have poor KAP. Healthcare providers are the primary source of reliable patient information, but studies unveiled that the KAP of IBD among healthcare providers was also low[32,33]. Having limited knowledge about a disease can impede the spread of accurate information. Therefore, previous studies suggest that priority should be placed on educating patients, healthcare professionals, and the general public.

There are some limitations in this study. It was conducted at a single institution, limiting its applicability to other hospitals in China. The questionnaire was designed by local investigators and was probably influenced by local policies and guidelines, further restricting the exportability of the questionnaire. The study has local scope, and the results cannot be extrapolated to other populations, which makes similar studies necessary in other locations. The study population shows high education and use of biological products, which suggests a selection bias. KAP surveys represent the situation of a specific population at a precise time point. Therefore, studies in other populations and time might be necessary to examine the actual KAP situation in China and the effect of education. Finally, all KAP surveys were susceptible to

Table 4 Practice dimension, *n* (%)

Practice	Always	Often	Sometimes	Seldom	Never
I will actively cooperate with the medical staff for my treatment and nursing	244 (69.1)	93 (26.3)	15 (4.2)	1 (0.3)	0
I will communicate with specialists regularly and follow up regularly	166 (47.0)	116 (32.9)	62 (17.6)	9 (2.5)	0
I will vent my bad emotions correctly, such as through exercise relaxation, music relaxation, and implied adjustment, to relieve mental stress	106 (30.0)	125 (35.4)	92 (26.1)	25 (7.1)	5 (1.4)
I will communicate with family members, close friends, and patients and gain encouragement and emotional support	94 (26.6)	117 (33.1)	92 (26.1)	41 (11.6)	9 (2.5)
	Yes, <i>n</i> (%)		No, <i>n</i> (%)		
I will take care to quit smoking and drinking	346 (98.0)		7 (2.0)		
I will take care to avoid staying up late and overworking	120 (34.0)	119 (33.7)	87 (24.6)	23 (6.5)	4 (1.1)
I will take care to choose appropriate physical exercise according to my physical condition	96 (27.2)	95 (26.9)	105 (29.7)	50 (14.2)	7 (2.0)
If there is an ostomy, I will go to an IBD specialist for standard treatment	336 (95.2)	17 (4.8)	0	0	0
If I am treated with biological agents, I will pay attention to monitoring the related side effects	179 (50.7)	107 (30.3)	52 (14.7)	11 (3.1)	4 (1.1)
If a food allergy is identified, I will take care to avoid it in my daily diet	210 (59.5)	105 (29.7)	30 (8.5)	5 (1.4)	3 (0.8)
I will use a "diet diary" to identify foods that may cause discomfort, such as abdominal pain or diarrhea, and try to avoid them in my future diet	106 (30.0)	94 (26.6)	67 (19.0)	42 (11.9)	44 (12.5)
I will improve my understanding of diseases and treatment through WeChat groups, networks, and popular science lectures	100 (28.3)	85 (24.1)	104 (29.5)	52 (14.7)	12 (3.4)
I will insist on taking medicine or receiving infusion treatment of biological agents as prescribed by my physician	247 (70.0)	86 (24.4)	16 (4.5)	3 (0.8)	1 (0.3)
I will encourage and help other people with IBD as much as I can	135 (38.2)	78 (22.1)	93 (26.3)	37 (10.5)	10 (2.8)

IBD: Inflammatory bowel disease.

Table 5 Correlation analysis

	Knowledge dimension	Attitude	Practice
Knowledge dimension	1		
Attitude	0.371 ( $P < 0.001$ )	1	
Practice	0.100 ( $P < 0.001$ )	0.452 ( $P < 0.001$ )	1

Table 6 Univariate and multivariate analysis of knowledge

Variables	Univariate analysis		Multivariate analysis	
	OR (95%CI)	<i>P</i> value	OR (95%CI)	<i>P</i> value
Gender				
Male	1.09 (0.62-1.92)	0.751		
Female	Ref			
Age				
≤ 20	Ref		Ref	
20-30	2.80 (1.10-7.09)	0.030	3.01 (0.97-9.38)	0.057
30-40	2.17 (0.84-5.63)	0.111	4.06 (1.04-15.82)	0.043
> 40	0.76 (0.33-1.75)			

Ethnicity				
Han	3.83 (1.13-12.94)	0.031	3.70 (0.80-16.97)	0.093
Minorities	Ref		Ref	
Residence				
Rural	Ref		Ref	
City	3.08 (1.56-6.07)	0.001	1.69 (0.74-3.84)	0.213
Suburb/urban-rural combination	1.95 (0.97-3.90)	0.060	1.33 (0.58-3.03)	0.496
Education				
Primary school and below	Ref			
Middle school	2.99 (1.15-7.76)	0.025	3.98 (1.29-12.33)	0.017
High school/technical secondary school	11.80 (4.20-33.17)	< 0.001	14.06 (3.92-50.38)	< 0.001
Junior college/bachelor's degree and above	20.70 (7.75-55.28)	< 0.001	15.20 (4.15-55.65)	< 0.001
Work status				
Employed	4.07 (2.23-7.41)	< 0.001	1.34 (0.63-2.85)	0.444
Other	Ref		Ref	
Monthly per capita income				
< 5000	Ref		Ref	
5000-10000	3.94 (1.84-8.43)	< 0.001	2.04 (0.81-5.18)	0.133
> 10000	2.46 (1.17-5.18)	0.018	0.90 (0.34-2.36)	0.823
Marital status				
Unmarried or other	Ref		Ref	
Married	0.61 (0.35-1.07)	0.083	0.85 (0.33-2.16)	0.734
Smoking habit				
No (no smoking)	Ref			
Yes (smoking or used to smoke)	0.60 (0.33-1.12)	0.10		
Drinking habit				
No (no drinking)	Ref			
Yes (drinking or used to drink)	0.85 (0.49-1.50)	0.584		
What kind of IBD is being diagnosed				
Ulcerative colitis	0.50 (0.29-0.85)	0.011	0.57 (0.28-1.18)	0.132
Crohn's disease	Ref		Ref	
Duration of IBD				
< 1 yr	1.14 (0.54-2.39)	0.729		
1-2 yr	0.98 (0.39-2.45)	0.964		
> 2 yr	Ref			
Ostomy?				
Yes	0.51 (0.21-1.23)	0.135		
No	Ref			
Comorbidities				
Yes	0.62 (0.32-1.19)	0.149		
None	Ref			
Family history of IBD				
Yes	1.86 (0.23-15.16)	0.560		

No	Ref	
Surgical history		
Yes	1.15 (0.67-1.97)	0.613
No	Ref	
History of drug allergy		
Yes	1.40 (0.60-3.29)	0.433
No	Ref	
What kind of treatment is being received?		
5-aminosalicylic acid drugs (e.g., mesalazine)	Ref	
Glucocorticoids	-	-
Immunosuppressants (e.g., azathioprine, tacrolimus, cyclosporine, etc.)	0.46 (0.07-2.99)	0.418
Biological agents (e.g., infliximab, vedolizumab, ustekinumab)	2.11 (0.77-5.80)	0.148
Biological agents + immunosuppressants	1.69 (0.34-8.40)	0.520
Biological agents + 5-aminosalicylic acid drugs	-	-

IBD: Inflammatory bowel disease.

**Table 7 Univariate and multivariate analysis of attitude**

Variables	Univariate analysis		Multivariate analysis	
	OR (95%CI)	P value	OR (95%CI)	P value
<b>Knowledge score (as continuous variables)</b>	1.24 (1.14-1.34)	< 0.001	1.23 (1.11-1.36)	< 0.001
Gender				
Male	1.42 (0.73-2.74)	0.300		
Female	Ref			
Age				
≤ 20	Ref			
20-30	1.49 (0.52-4.25)	0.461		
30-40	1.29 (0.43-3.82)	0.651		
> 40	1.27 (0.44-3.65)	0.656		
Ethnicity				
Han	4.69 (1.31-16.80)	0.017	3.21 (0.66-15.59)	0.149
Minorities	Ref		Ref	
Residence				
Rural	Ref		Ref	
City	2.47 (1.06-5.76)	0.037	1.63 (0.61-4.32)	0.329
Suburb/urban-rural combination	1.12 (0.51-2.44)	0.779	0.98 (0.39-2.47)	0.968
Education				
Primary school and below	Ref		Ref	
Middle school	0.95 (0.30-2.97)	0.925	0.85 (0.23-3.08)	0.803
High school/technical secondary school	2.37 (0.70-8.05)	0.165	0.87 (0.22-3.49)	0.841
Junior college/bachelor's degree and above	2.91 (0.95-8.94)	0.062	0.82 (0.20-3.26)	0.774
Work status				
Employed	2.65 (1.32-5.30)	0.006	1.54 (0.64-3.70)	0.338

Other	Ref		Ref	
Monthly per capita income				
< 5000	Ref		Ref	
5000-10000	2.22 (0.97-5.09)	0.060	1.10 (0.42-2.89)	0.850
> 10000	2.16 (0.85-5.46)	0.105	1.06 (0.35-3.17)	0.924
Marital status				
Unmarried or other	Ref			
Married	0.97 (0.51-1.88)	0.937		
Smoking habit				
No (no smoking)	Ref			
Yes (smoking or used to smoke)	0.88 (0.40-1.94)	0.755		
Drinking habit				
No (no drinking)	Ref			
Yes (drinking or used to drink)	1.16 (0.57-2.36)	0.689		
What kind of IBD is being diagnosed				
Ulcerative colitis	0.75 (0.39-1.44)	0.383		
Crohn's disease	Ref			
Duration of IBD				
< 1 yr	0.92 (0.36-2.35)	0.866		
1-2 yr	0.91 (0.29-2.90)	0.873		
> 2 yr	Ref			
Ostomy?				
Yes	0.55 (0.19-1.53)	0.250		
No	Ref			
Comorbidities				
Yes	0.68 (0.31-1.51)	0.341		
None	Ref			
Family history of IBD				
Yes	1.05 (0.13-8.64)	0.962		
No	Ref			
Surgical history				
Yes	1.14 (0.59-2.19)	0.698		
No	Ref			
History of drug allergy				
Yes	1.52 (0.52-4.47)	0.448		
No	Ref			
What kind of treatment is being received?				
5-aminosalicylic acid drugs ( <i>e.g.</i> , mesalazine)	Ref		Ref	
Glucocorticoids	-	-	-	-
Immunosuppressants ( <i>e.g.</i> , azathioprine, tacrolimus, cyclosporine, <i>etc.</i> )	0.24 (0.02-2.22)	0.206	0.38 (0.03-4.43)	0.438
Biological agents ( <i>e.g.</i> , infliximab, vedolizumab, ustekinumab)	1.10 (0.24-5.02)	0.899	0.88 (0.17-4.53)	0.878
Biological agents + immunosuppressants	0.21 (0.03-1.32)	0.096	0.16 (0.02-1.17)	0.070
Biological agents + 5-aminosalicylic acid drugs	0.35 (0.05-2.51)	0.298	0.17 (0.02-1.51)	0.113

IBD: Inflammatory bowel disease.

**Table 8 Univariate and multivariate analysis of practice**

Variables	Univariate analysis		Multivariate analysis	
	OR (95%CI)	P value	OR (95%CI)	P value
Knowledge score (as continuous variables)	1.10 (1.02-1.19)	0.020	0.96 (0.87-1.06)	0.412
Attitude score (as continuous variables)	1.21 (1.13-1.30)	< 0.001	1.20 (1.11-1.30)	< 0.001
Gender				
Male	1.62 (0.86-3.04)	0.134		
Female	Ref			
Age				
≤ 20	Ref			
20-30	1.25 (0.45-3.50)	0.672		
30-40	1.65 (0.53-5.11)	0.386		
> 40	1.16 (0.41-3.30)	0.780		
Ethnicity				
Han	0.65 (0.14-3.11)	0.589		
Minorities	Ref			
Residence				
Rural	Ref		Ref	
City	2.41 (1.08-5.40)	0.033	2.01 (0.80-5.04)	0.139
Suburb/urban-rural combination	1.12 (0.53-2.38)	0.768	1.12 (0.49-2.58)	0.788
Education				
Primary school and below	Ref			
Middle school	0.66 (0.20-2.22)	0.503		
High school/technical secondary school	2.10 (0.56-7.84)	0.272		
Junior college/bachelor's degree and above	1.58 (0.49-5.11)	0.441		
Work status				
Employed	2.76 (1.41-5.40)	0.003	1.93 (0.88-4.21)	0.099
Other	Ref		Ref	
Monthly per capita income				
< 5000	Ref		Ref	
5000-10000	2.42 (1.06-5.51)	0.036	1.31 (0.51-3.33)	0.578
> 10000	1.71 (0.74-3.94)	0.207	0.86 (0.32-2.28)	0.755
Marital status				
Unmarried or other	Ref			
Married	0.65 (0.34-1.25)	0.200		
Smoking habit				
No (no smoking)	Ref			
Yes (smoking or used to smoke)	0.86 (0.41-1.84)	0.706		
Drinking habit				
No (no drinking)	Ref			

Yes (drinking or used to drink)	1.18 (0.60-2.35)	0.631		
What kind of IBD is being diagnosed				
Ulcerative colitis	0.80 (0.43-1.52)	0.501		
Crohn's disease	Ref			
Duration of IBD				
< 1 yr	1.39 (0.59-3.27)	0.445		
1-2 yr	0.74 (0.27-2.01)	0.558		
> 2 yr	Ref			
Ostomy				
Yes	0.62 (0.22-1.72)	0.354		
No	Ref			
Comorbidities				
Yes	0.43 (0.21-0.88)	0.022	0.50 (0.23-1.09)	0.082
None	Ref		Ref	
Family history of IBD				
Yes	-	-		
No	Ref			
Surgical history				
Yes	1.11 (0.59-2.09)	0.741		
No	Ref			
History of drug allergy				
Yes	0.83 (0.35-1.99)	0.682		
No	Ref			
What kind of treatment is being received?				
5-aminosalicylic acid drugs ( <i>e.g.</i> , mesalazine)	Ref			
Glucocorticoids	-	-		
Immunosuppressants ( <i>e.g.</i> , azathioprine, tacrolimus, cyclosporine, <i>etc.</i> )	0.19 (0.02-1.41)	0.104		
Biological agents ( <i>e.g.</i> , infliximab, vedolizumab, ustekinumab)	1.38 (0.38-4.97)	0.622		
Biological agents + immunosuppressants	2.44 (0.23-26.30)	0.463		
Biological agents + 5-aminosalicylic acid drugs	0.94 (0.13-6.63)	0.948		

IBD: Inflammatory bowel disease.

social desirability bias, in which participants may have been more likely to provide the expected response than the actual answer[34].

## CONCLUSION

In conclusion, this study suggests that Chinese patients with IBD have good knowledge, positive attitudes, and active practice toward their disease. Nevertheless, some specific items warranting more education were identified, especially regarding the etiology and contributing factors to the disease, extraintestinal manifestations, glucocorticoid side effects, and nutrient absorption.

## ARTICLE HIGHLIGHTS

### Research background

The management of inflammatory bowel disease (IBD) necessitates the adoption of healthy lifestyle habits, which requires proper knowledge, attitudes, and practice of the specific lifestyle routines to implement. However, patients with IBD generally have poor knowledge, attitude, and practice (KAP) of their disease, while the data from China are lacking.

### Research motivation

The motivation of this study is to help healthcare providers to improve the patient's self-management of IBD.

### Research objectives

The object of this study is to investigate the KAP of patients with IBD toward their disease in Zhejiang Province, China.

### Research methods

Self-designed questionnaires were administered to the participants through WeChat on the SoJump platform (<https://www.wjx.cn/app/survey.aspx>). Pearson's correlation analysis was used to determine the pairwise correlations among KAP scores. A multivariate logistic regression analysis was further performed to determine the independent factors associated with their KAP scores.

### Research results

A total of 353 patients (224 males) with IBD completed the questionnaires. Their mean KAP scores were  $10.05 \pm 3.46$  (possible range: 0-14),  $41.58 \pm 5.23$  (possible range: 0-56),  $44.20 \pm 7.39$  (possible range: 0-56), respectively, indicating good knowledge, positive attitude, and proactive practice toward IBD. Age and education were independently associated with their KAP.

### Research conclusions

Chinese patients with IBD might have good knowledge, a positive attitude, and proactive practice toward their disease. Nevertheless, some specific items warranting more education were identified, especially regarding the etiology and contributing factors to the disease, extraintestinal manifestations, glucocorticoid side effects, and nutrient absorption.

### Research perspectives

The findings of this study may be useful for the management and self-management of IBD patients in clinical practice.

## FOOTNOTES

**Author contributions:** Fang LY and Guo XR carried out the study and participated in collecting data; Shao XX drafted the manuscript; Wang WZ and Shi RX performed the statistical analysis and participated in its design; Lin DP participated in the acquisition, analysis, and interpretation of data; and all authors read and approved the final manuscript.

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**Country/Territory of origin:** China

**ORCID number:** Dao-Po Lin [0000-0003-0785-7675](https://orcid.org/0000-0003-0785-7675).

**S-Editor:** Wang JJ

**L-Editor:** A

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