Hindawi Publishing Corporation
Ulcers
Volume 2011, Article ID 594532, 5 pages
doi:10.1155/2011/594532

Clinical Study

Fat Restriction Is Associated with Impaired Quality of Life in Patients with Ulcerative Colitis and Crohn's Disease

A. Kuwabara,[1,2] H. Nakase,[3] H. Tsuji,[4] K. Shide,[4] T. Chiba,[3] N. Inagaki,[4] and K. Tanaka[2]

[1] *Department of Health and Nutrition, Osaka Shoin Women's University, 4-2-26 Hishiyanishi, Higashiosaka-shi, Osaka 577-8550, Japan*
[2] *Department of Food and Nutrition, Kyoto Women's University, 35 Imakumano-kitahiyoshi-cho, Higashiyama-ku, Kyoto 605-8501, Japan*
[3] *Department of Gastroenterology and Hepatology, Kyoto University Graduate School of Medicine, 54 Shogoin kawahara-cho, Sakyo-ku Kyoto, 606-8507, Japan*
[4] *Department of Diabetes and Clinical Nutrition, Kyoto University Graduate School of Medicine, 54 Shogoin kawahara-cho, Sakyo-ku Kyoto, 606-8507, Japan*

Correspondence should be addressed to K. Tanaka, ktanaka@zeus.eonet.ne.jp

Received 9 August 2010; Accepted 21 September 2010

Academic Editor: Gyula Mozsik

Inflammatory bowel disease (IBD), ulcerative colitis (UC) and Crohn's disease, is reported to be associated with impaired health-related quality of life (QOL). Although decreased QOL in these subjects has been reported to be associated with various factors, the effect of nutritional therapy, especially nutrients intake on QOL has received less attention. In this study, we evaluated the various factors including nutrients intake on QOL using SF-8 in 64 patients with IBD. Patients with IBD seem to have decreased QOL especially in the mental aspects. The percentage energy intake from fat of total energy fat intake (% energy) of the whole subjects, was lower than those of the annual National Nutrition Survey in Japan. Multiple regression analyses revealed that fat intake (% energy) was a significant predictor for mental component summary. In conclusion, fat restriction contributes to impaired QOL especially in the mental aspects in IBD patients.

1. Introduction

Inflammatory bowel disease (IBD); ulcerative colitis (UC) and Crohn's disease, is reported to be associated with impaired health-related quality of life (HR-QOL). In this paper, HR-QOL will be simply designated as QOL. Decreased QOL in these subjects has been reported to be related to various factors such as age, gender [1, 2], treatment effects [3], disease activity, and social environment [4]. However, the effect of nutritional therapy on the QOL of IBD patients has received less attention, most of which is devoted to the parenteral nutrition therapy, not the nutritional therapy in general [5, 6].

Since excessive fat intake is considered to worsen the inflammation in the intestine, its restriction has traditionally been employed in Japan as the oral nutritional therapy for IBD patients, especially for those with CD, which, however, has its own pros and cons.

Recently, we have studied the possible involvement of hypovitaminosis D and K in the development of osteoporosis in IBD patients [7]. In face of apparently sufficient intake of these vitamins, their plasma levels were quite low in these patients. Paradoxically, plasma concentrations of vitamin D and K were correlated with the fat intake but not with their intake of these vitamins. These results were more prominent in patients with CD than those with UC. Then it was concluded that fat-soluble substances such as vitamin D and K were not effectively absorbed from the intestine without concomitant intake of enough fat.

Through this paper, we were interested in what fat restriction means from the patients' perspectives and studied

the effect of fat restriction on the QOL of IBD subjects in this paper.

2. Subjects and Methods

2.1. Subjects. Study subjects were 64 patients with IBD attending the gastroenterology clinic at the Kyoto University Hospital; 33 with CD (19 men/14 women) and 31 with UC (20 men/11 women). Detailed information was given and written consent was obtained. The study protocol was approved by the ethical committee of the Kyoto Women's University. Almost all patients (27/33 in CD and 28/33 in UC) were receiving 5-aminosalicylic acid. Glucocorticoid therapy was given to four and two patients with CD and UC, respectively. Immunosuppressive drug therapy was performed in 25 and 4 patients with CD and UC, respectively. Eight patients with CD, but none with UC, were on combined therapy of infliximab, synthetic glucocorticoid, and immunosuppressive drug. Fifteen patients with CD and one with UC were on enteral or total parenteral nutrition therapy, respectively.

2.2. Methods

2.2.1. Dietary Information. Dietary information was obtained from food intake records in 2 weekdays by the patients. By calculating these records, their energy and nutrients intakes were obtained by computer software program (Healthy Maker Pro 501, Mushroom soft Corp.).

2.2.2. QOL Measurement. QOL was assessed using the Japanese Short Form Health Survey (SF-8), a widely used generic questionnaire [8]. Eight subscales are obtained; physical function (PF), role physical (RP), bodily pain (BP), general health (GH), vitality (VT), social function (SF), role emotional (RE), and mental health (MH). RP and RE refer to the limitations due to physical or emotional reasons, respectively. They are also summarized into two summary scores: physical component summary (PCS) and mental component summary (MCS). Data are transformed to deviation scores based on Japanese norms [8]. Higher scores indicate better QOL, with 50 corresponding to the national norms.

2.2.3. Statistical Analyses. Statistical analyses were performed using SPSS 17.0 J for Windows (SPSS. Japan Inc., Tokyo, Japan). Comparison of data from IBD patients with Japanese norms was done by one-sample t test. The difference between two independent groups was analyzed by unpaired t test or Mann-Whitney test depending on normality. Correlations between two independent variables were analyzed by Pearson's or Spearman's correlations. Multiple regression analysis was performed to determine independent factors for QOL scores in IBD patients.

3. Result

3.1. Background Profiles and Biochemical Indices. The baseline characteristics of the patients are shown in Table 1.

Table 1: Background profiles and results from blood tests in patients with CD and UC.

	CD	UC	P value
Age (y)	35.6 ± 7.3	41.7 ± 17.3	.343[a]
Sex (F/M)	19/14	20/11	—
Disease duration (y)	13.7 ± 7.4	6.8 ± 4.8	<.001[b]
Body mass index (kg/m^2)	19.5 ± 2.3	21.1 ± 3.3	.025[b]
Disease location (involving small bowel/not involving small bowel)	30/2	0/31	—
Glucocorticoid therpy	4	2	—
Immunosuppressive therapy	25	4	—
Immunopotentiating therapy (TNF-α)	8	0	—
Enteral or total parenteral nutrition therapy	15	1	—
C-reactive protein (g/dl)	0.6 ± 1.0	0.3 ± 0.6	.135[b]
Albumin (g/dl)	3.9 ± 0.4	4.3 ± 0.3	<.001[b]
Total cholesterol (mg/dl)	126.9 ± 25.0	177.1 ± 40.3	<.001[b]

Values represent mean ± SD. Comparison of indices between patients with CD and those with UC was done by unpaired t test[a] or Mann-Whitney test[b] depending on normality.

CD patients had significantly longer disease duration and lower BMI than UC patients. While nutritional indices such as serum albumin and total cholesterol were lower in CD subjects, there was no significant difference in C-reactive protein which is an inflammatory parameter between these groups. Most of patients were in remission.

3.2. Energy and Nutrients Intake in CD and UC Patients. Food intake could be evaluated in 62 patients (31 with CD and 31 with UC). Energy and nutrients intake in these patients is shown in Table 2. Fourteen patients with CD were on enteral nutrition, and each one of subjects with CD and UC was on total parental nutrition. Although the energy intake was not significantly different between the two groups, fat intake was significantly lower in CD patients than UC subjects. The annual National Nutrition Survey in Japan (NNS-J) in 2008 showed that in subjects of 30–39 or 40–49, years of age including both genders [9], the daily fat intake (% energy) was 26.5% or 25.6%, respectively. These were significantly higher than those of IBD subjects in this study ($P = .001$; data not shown). Subjects with enteral or parental nutrition had fat intake only approximately half of that in subjects with oral intake (data not shown). The percentage energy intake from protein, fat, and carbohydrates was significantly different between CD and UC subjects.

Table 2: Comparison of nutrient intakes in CD and UC patients.

		IBD ($n = 62$)	CD ($n = 31$)	UC ($n = 31$)	P value
Energy	Intake (kcal)	1816 ± 465 (1804)	1847 ± 392 (1842)	1785 ± 533 (1764)	NS
Protein	Intake (g)	66.0 ± 21.8 (63.5)	71.0 ± 20.6 (67.2)	60.9 ± 22.0 (61.6)	NS
Fat	Intake (g)	44.7 ± 21.6 (43.0)	38.7 ± 17.6 (37.4)	50.6 ± 23.6 (48.1)	$P < .05$
Carbohydrates	Intake (g)	275.4 ± 91.6 (268.6)	298.3 ± 93.1 (275.7)	252.4 ± 85.4 (254.9)	$P < .05$
Protein (% energy)		14.4 ± 2.7 (14.2)	15.0 ± 2.2 (15.6)	13.5 ± 2.9 (13.6)	$P < .001$
Fat (% energy)		22.4 ± 9.6 (24.6)	19.5 ± 8.9 (18.9)	25.2 ± 9.5 (26.8)	$P < .001$
Carbohydrates (% energy)		63.2 ± 9.6 (62.4)	65.2 ± 8.6 (64.0)	56.5±9.5 (60.5)	$P < .001$

Data are expressed as mean ± SD with the values in parentheses showing the median. Comparison of indices between patients with CD and those with UC was done by unpaired t test

Table 3: Dimensional SF-8 scores in patients with CD and UC.

	IBD ($n = 64$)	CD ($n = 33$)	UC ($n = 31$)
PF	50.1 ± 4.7 (53.6)	50.1 ± 4.5 (53.6)	50.0 ± 5.0 (53.6)
RP	*48.2 ± 6.8 (48.5)	48.7 ± 5.3 (48.5)	47.7 ± 8.1 (48.5)
BP	50.8 ± 7.6 (51.8)	50.5 ± 6.8 (51.8)	51.2 ± 8.5 (51.8)
GH	*47.8 ± 7.5 (50.7)	*47.7 ± 6.5 (50.7)	47.8 ± 8.5 (50.7)
VT	49.6 ± 6.5 (54.5)	48.4 ± 5.7 (45.3)	51.0 ± 7.1 (54.5)
SF	**46.2 ± 8.3 (45.2)	*46.9 ± 7.2 (45.2)	*45.5 ± 9.4 (45.2)
RE	*48.3 ± 6.4 (49.1)	48.0 ± 6.5 (49.1)	48.6 ± 6.5 (49.1)
MH	**47.3 ± 6.5 (45.0)	*46.8 ± 7.5 (45.0)	*47.8 ± 5.4 (50.3)
PCS	49.0 ± 6.7 (49.1)	49.2 ± 5.4 (49.0)	48.9 ± 7.9 (50.0)
MCS	***46.1 ± 6.6 (46.5)	**45.7 ± 7.1 (46.6)	**46.6 ± 6.0 (46.5)

Data are expressed as mean ±SD with median in the parentheses. One-sample t test was used for comparison between Japanese norms and scores of CD or UC patients. The asterisk denotes the significant difference (*$P > .05$; **$P > .01$; ***$P > .001$).

3.3. QOL Assessment. In Table 3 is shown the eight subscales and two summary scores of SF-8 in subjects with IBD patients. Since data are expressed as the deviation values normalized by the Japanese normative values, the value "50" correponds to Japanese norm. Subscales such as RP, GH, SF, MH, and MCS were significantly lower than the Japanese norms.

Table 3 shows the comparison between CD and UC subjects. There were no significant differences in the eight subscales and two summary scores except for lower VT in CD patients than in those with UC.

3.4. Correlations between PCS/MCS Scores and Clinical Characteristics, Biochemical Markers, and Nutritients Intakes. We analyzed the correlation between these summary scores and biochemical indices, fat intake expressed as the percentage energy intake from fat of total energy, fat intake (% energy) (Table 4). Fat intake (% energy) was significantly correlated with MCS in CD patients. There was significant but weak, correlation between PCS and serum albumin and MCS and BMI in UC patients. In the whole subjects, BMI was significantly correlated with PCS, and fat intake (% energy) was associated with MCS.

3.5. Multiple Regression Analysis for Variable Associated with PCS/MCS Scores. Then multiple regression analyses were done to study the determinant(s) of the subjects' PCS and MCS (Table 5). Variables included in the analysis were types of disease (CD/UC), BMI, serum concentrations of Alb, and fat intake (% energy). BMI was the significant predictor of PCS score (βcoefficient 0.29, $P = .023$) whereas fat intake was the only significant determinant of MCS score (βcoefficient 0.29, $P = .027$).

4. Discussion

Recently, various questionnaires have been developed for QOL evaluation, both generic and disease targeted [10]. Generic ones, by their definition, only consist of questions related to the subjects' general status and do not include the questions related to the features which are specific to a certain disease. Therefore, they are applicable to such studies as comparing the impact on QOL by various diseases or even to the evaluation of healthy subjects. In contrast, disease-targeted ones include items specific to a certain disease. They can be more sensitive than the generic ones in detecting the QOL impairment closely related to a certain disease state but are not applicable to the evaluation of patients with other diseases. Various disease-targeted questionnaires have been developed for IBD subjects; the most well known of which would be IBDQ (inflammatory bowel disease questionnaire) including many items related to the patients' gastroenterological problems [11]. Since the purpose of our current work was to study the effects of nutritional therapy on the patients' QOL, we considered it more appropriate to evaluate the patients' QOL using the generic questionnaire.

SF-36 is one of the most commonly used generic questionnaires, and SF-8, used in this study, is the shortened one. Eight subscales, two summary scores are obtained, and expressed as the deviation values, which are normalized by the nations' normative value. Many previous papers on the QOL of IBD patients using SF-36 seem to have handled the data improperly [2, 4]. For example, Bernklev and Andersson expressed their data as the 0–100 scale scores [2, 4], which

Table 4: Correlations between PCS/MCS scale scores and clinical characteristics, biochemical markers, and fat intake as proportion of total energy intake.

		IBD ($n = 64$)		CD ($n = 33$)		UC ($n = 31$)	
		PCS	MCS	PCS	MCS	PCS	MCS
Diseaae duration (y)	r	0.012	−0.175	0.070	−0.221	−0.085	−0.066
Body mass index (kg/m^2)	r	0.261*	0.088	0.144	−0.075	0.248	0.415*
C-reactive protein (g/dl)	r	−0.083	0.075	−0.058	0.196	−0.116	−0.045
Albumin (g/dl)	r	0.235	0.082	0.092	0.064	0.424*	0.059
Total cholesterol (mg/dl)	r	0.033	0.196	−0.132	0.169	0.174	0.249
Fat intake(% energy)	r	0.175	0.287*	0.146	0.458***	0.238	0.109

The asterisk denotes the value is significant correlation (*$P < .05$, **$P < .01$, ***$P < .001$) by Pearson's correlation or Spearman's correlation.

Table 5: Multiple regression analyses for the predictor(s) of PCS and MCS scores in IBD patients.

	PCS score		MCS score	
	$r^2 = 0.086$	$P = .023$	$r^2 = 0.081$	$P = .027$
	β	P	β	P
CD/UC (1;CD, 2;UC)	−0.141	.283	−0.059	.657
BMI	0.293	.023	0.069	.594
Alb	0.141	.309	0.024	.855
Fat intake (% total energy)	0.121	.347	0.285	.027

Abbreviations are as follow: β for β coefficient and P for P value. Determinants of independent predictors for PCS/MCS scores were analyzed by multivariate analysis with stepwise method. Variables included were CD/UC, BMI, serum albumin concentration, and fat intake (% total energy)

can be misleading [12]. In the present paper, data were analyzed according to the authorized instruction.

In this study, subscales such as RP, GH, SF, RE, MH, and MCS were significantly lower than the Japanese norms. Decreased RP in face of normal PF is conceivable considering that the patients do not have severe physical impairment but have some limitation in their daily activities by reasons such as the bowel habit problem. Impaired SF would be also conceivable from the similar viewpoint. As a whole, patients with IBD seem to have decreased QOL especially in the mental aspects.

Then, we have analyzed variables associated with PCS and MCS. There were substantial differences in the objective clinical features of patients with CD and UC. For example, CD patients had longer disease duration and lower nutritional status than those of UC subjects. Nevertheless, there were no significant differences in 7 out of 8 dimensions between the two conditions. Namely, QOL which represents the patients' subjective evaluation of their health states seems to be impaired in both CD and UC patients.

Then, we have studied the determinants for PCS and MCS. PCS score was correlated with indices representing their nutritional status such as BMI ($r = 0.261$, $P < .05$) and albumin with marginal significance ($r = 0.235$, $P = .066$). In contrast, none of these factors were significantly correlated with MCS. Thus, it was considered unlikely that disease activities or other clinical features alone could account for the impaired mental aspects of QOL in these subjects. The association of QOL with mental aspects of the subjects has been previously reported. Boye et al. reported that neuroticism was a significant predictor for mental and vitality subscales of SF-36 in IBD patients using multiple regression analyses controlled for gender, age, and clinical disease activity [13]. Martin also reported that QOL was not closely correlated with the clinical features in CD patients [14]. These results, together with our current findings, suggest that mental aspects can more strongly affect QOL than clinical ones in IBD patients.

Theoretically, it is well known that the QOL scores in subjects with disabilities are higher than those anticipated from their objective physical impairment (disability paradox) [15]. This phenomenon is because subjects with long-term disabilities change their internal standard and make the adaptation to their actual status (response shift) [16].

Next, we have made a hypothesis that nutrients intake such as fat restriction may contribute to the impairment of mental aspects of QOL in these subjects. Although CD patients had lower fat intake than UC subjects, fat intake (% energy) of the whole subjects was significantly lower than those of the NNS-J.

Then, we have analyzed the association between these summary scores and their fat intake (% energy). Fat intake (% energy) was significantly associated with MCS, but not with PCS in patients with IBD. When CD and UC patients were separately analyzed, the correlation coefficients was almost the same, but not statistically significant anymore, probably due to the smaller number of study subjects. We then have performed the multivariate analysis. Of the various factors included for analysis types of disease (CD/UC), BMI, serum albumin, fat intake (% energy), BMI, and fat intake (% energy) were the only significant determinants of PCS and MCS, respectively. Since many IBD patients are young, they are quite likely to favor foods rich in fat. Nevertheless, fat

restriction is the common practice in the nutritional therapy for IBD. It is quite conceivable that fat restriction impairs the mental and social aspects of QOL, and enteral nutrition will make the matter even worse. Of interest, but not apparently compatible with our findings, is the report by Kuriyama et al. They reported that enteral nutrition improved the health-related quality of life of Crohn's disease patients with long-term disease duration, and enteral nutrition was an independent factor for bowel symptoms and systemic symptoms [17]. In their study, IBDQ was employed for the assessment of QOL, which is an IBD-targeted questionnaire with many items related to the patients' gastroenterological problems. Thus it is likely that only the physical aspects of QOL were detected, and mental aspects were overlooked in their study.

Two additional considerations might be added to the current finding: decreased QOL in IBD patients and its association with fat restriction. First, considering the response shift, actual detrimental effect of fat restriction on the mental aspects of QOL might be even greater. Second, the adaptation process seems to be only partial. Chronic pain is known to be associated with response shift [18]. However, the association of fat restriction with impaired mental aspects of QOL was obvious in the current study. Since food intake is one of the most fundamental requirements, it is likely that subjects with fat restriction cannot easily adapt to a situation with long-term fat-restricted diet.

In conclusion, fat restriction exerts undesirable effects on IBD patients in two different ways: decreased intestinal absorption of fat-soluble substances such as vitamin D and K and impaired QOL especially in the mental aspects.

Conflict of interests

None of the authors have any conflict of interests.

References

[1] F. Blondel-Kucharski, C. Chircop, P. Marquis et al., "Health-related quality of life in Crohn's disease: a prospective longitudinal study in 231 patients," *American Journal of Gastroenterology*, vol. 96, no. 10, pp. 2915–2920, 2001.

[2] T. Bernklev, J. Jahnsen, I. Lygren, M. Henriksen, M. Vatn, and B. Moum, "Health-related quality of life in patients with inflammatory bowel disease measured with the short form-36: psychometric assessments and a comparison with general population norms," *Inflammatory Bowel Diseases*, vol. 11, no. 10, pp. 909–918, 2005.

[3] A. Cortot, J.-F. Colombel, P. Rutgeerts et al., "Switch from systemic steroids to budesonide in steroid dependent patients with inactive Crohn's disease," *Gut*, vol. 48, no. 2, pp. 186–190, 2001.

[4] P. Andersson, G. Olaison, P. Bendtsen, P. Myrelid, and R. Sjödahl, "Health related quality of life in Crohn's proctocolitis does not differ from a general population when in remission," *Colorectal Disease*, vol. 5, no. 1, pp. 56–62, 2003.

[5] P. B. Jeppesen, E. Langholz, and P. B. Mortensen, "Quality of life in patients receiving home parenteral nutrition," *Gut*, vol. 44, no. 6, pp. 844–852, 1999.

[6] D. M. Richards and M. H. Irving, "Assessing the quality of life of patients with intestinal failure on home parenteral nutrition," *Gut*, vol. 40, no. 2, pp. 218–222, 1997.

[7] A. Kuwabara, K. Tanaka, N. Tsugawa et al., "High prevalence of vitamin K and D deficiency and decreased BMD in inflammatory bowel disease," *Osteoporosis International*, vol. 20, no. 6, pp. 935–942, 2009.

[8] S. Fukuhara and Y. Suzukamo, *Manual of the SF-8 Japanese Version*, Institute for Health Outcomes & Process Evaluation Research, Kyoto, Japan, 2004.

[9] Ministry of Health, Labour, and Welfare, "The National Nutrition Survey 2008," Daiichi-Shuppan, Tokyo, Japan, 2009, http://www.mhlw.go.jp/houdou/2009/11/h1109-1.html.

[10] P. M. Fayers and D. Machin, *Quality of Life. Assessment, Analysis and Interpretation*, John Wiley & Sons, West Sussex, UK, 2000.

[11] H. Hashimoto, J. Green, Y. Iwao, T. Sakurai, T. Hibi, and S. Fukuhara, "Reliabilty, validity, and responsiveness of the Japanese version of the Inflammatory Bowel Disease Questionnaire," *Journal of Gastroenterology*, vol. 38, no. 12, pp. 1138–1143, 2003.

[12] J. E. Ware, M. Kosinski, and J. E. Dewey, "Scoring SF-36 scales," in *How to Score Version Two of the SF-36R Health Survey*, pp. 27–48, Quality Metric. Inc, Lincoln, RI, USA, 2001.

[13] B. Boye, K. E. A. Lundin, S. Leganger et al., "The INSPIRE study: do personality traits predict general quality of life (short form-36) in distressed patients with ulcerative colitis and Crohn's disease?" *Scandinavian Journal of Gastroenterology*, vol. 43, no. 12, pp. 1505–1513, 2008.

[14] A. Martin, L. Leone, W. Fries, and R. Naccarato, "Quality of life in inflammatory bowel disease," *Italian Journal of Gastroenterology*, vol. 27, no. 8, pp. 450–454, 1995.

[15] G. L. Albrecht and P. J. Devlieger, "The disability paradox: high quality of life against all odds," *Social Science and Medicine*, vol. 48, no. 8, pp. 977–988, 1999.

[16] C. E. Schwartz, R. Bode, N. Repucci, J. Becker, M. A. G. Sprangers, and P. M. Fayers, "The clinical significance of adaptation to changing health: a meta-analysis of response shift," *Quality of Life Research*, vol. 15, no. 9, pp. 1533–1550, 2006.

[17] M. Kuriyama, J. Kato, N. Morimoto et al., "Enteral nutrition improves health-related quality of life in crohn's disease patients with long disease duration," *Hepato-Gastroenterology*, vol. 56, no. 90, pp. 321–327, 2009.

[18] A. J. Carr, B. Gibson, and P. G. Robinson, "Measuring quality of life is quality of life determined by expectations or experience?" vol. 322, no. 7296, pp. 1240–1243, 2001.