



ASSESSMENT OF NUTRITIONAL STATUS IN CORRELATION WITH QUALITY OF LIFE AND DISEASE ACTIVITY IN HOSPITALIZED PATIENTS WITH INFLAMMATORY BOWEL DISEASES

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ABSTRACT

Introduction: Patients with inflammatory bowel diseases have an impaired quality of life and can develop severe nutritional deficits. Many nutrition screening tools have been proposed but the nutrition screening tools with the most utility in inflammatory bowel diseases patients are still unknown.

The aim of the study was to assess the correlation between nutritional status and disease activity in inflammatory bowel diseases patients and to assess if nutritional status has an impact on quality of life.

Material and Methods: The study included 88 patients with active inflammatory bowel diseases admitted to our hospital. Disease activity was assessed by clinical and biological parameters and endoscopic scores. Nutritional status was assessed by BMI, MUST, NRS - 2002, O-PNI and CONUT. Quality of life was assessed by Short Inflammatory Bowel Diseases Questionnaire.

Results: In total, 50 patients with Crohn's disease and 38 patients with ulcerative colitis were eligible for our study. In Crohn's disease patients, CDAI and fecal calprotectin best correlated with albumin and SES - CD had a moderate correlation with albumin, O - PNI, MUST and NRS-2002; in ulcerative colitis patients, partial Mayo score had strong correlation with BMI, Mayo endoscopic score and fecal calprotectin showed a strong correlation with albumin. Short Inflammatory Bowel Diseases Questionnaire was strongly correlated with BMI in Crohn's disease patients and moderately correlated with MUST, albumin, BMI and NRS - 2002 in ulcerative colitis patients.

Conclusions: Malnutrition is common in inflammatory bowel diseases. Disease activity is reflected on the nutritional status of the patients and this impairs quality of life. The study opens the perspective of assuming that influencing the nutritional status of patients suffering from these diseases by appropriate nutritional treatment measures, this could be reflected in the increased quality of life of these patients.

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INTRODUCTION

Patients with inflammatory bowel diseases (IBD) have an impaired quality of life (QoL) and can develop severe nutritional deficits. There are different tools that help physicians to determine the impact of disease activity on an individual patient and most of them are based on assessment of daily symptoms and biomarkers of inflammation. Disease activity can be assessed either by clinical or endoscopic scores (1).

Disease activity and secondary malnutrition impairs health-related QoL(2). The evaluation of QoL enhances the understanding of the disease impact. Short IBD Questionnaire (SIBDQ) which is a 10 items shortened version of the original IBDQ which used to be 32 items measures QoL in four domains: bowel symptoms, emotional health, systemic symptoms and social function; it is a rapid and reliable

measure of QoL and an important patient-reported outcome (3).

Malnutrition in IBD is common and under-recognized, existing data suggesting a prevalence of 65%-75% in Crohn's disease (CD) and 18 - 62% in ulcerative colitis (UC)(4). Malnutrition can occur in both types of IBD, but it is more often a greater problem in CD than in UC because it can involve any part of the digestive system (5). Evaluation of nutritional status at admission, particularly in active disease is essential because early medical nutrition therapy can decrease disease morbidity and improve QoL. Many nutrition screening tools (NST) have been proposed, ESPEN and ASPEN recommending MUST for outpatient and NRS - 2002 for hospital settings; additional objective nutritional indexes are O-PNI or CONUT, but the NST with the most utility in IBD patients are still unknown. Due to the prognostic significance of malnutrition in IBD, early diagnosis via validated tools is of paramount importance.

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According to literature, these NST have been reported to be useful for predicting prognosis in conditions as chronic heart failure (6) and chronic kidney disease (7), but have been less studied in IBD.

The aim of the study was to assess the correlation between nutritional status and disease activity in IBD patients and to assess if nutritional status has an impact on QoL.

MATERIAL AND METHODS

The present study included 88 patients with IBD admitted to County Clinical Emergency Hospital of Constanța between January 01, 2017 and December 31, 2018. Inclusion criteria were: active CD (CDAI > 150, fecal Calprotectin C > 200 mg/kg, SES - CD > 3), active ulcerative colitis (partial Mayo score > 3, fC > 200 mg/kg, Mayo endoscopic score > 1), age > 16 years old, signed informed consent. Exclusion criteria were: Crohn's disease in remission, ulcerative colitis in remission, other types of colitis, age < 16 years old.

At admission, all patients were evaluated according to current standard protocol (complete blood count, C reactive protein, blood chemistry including albumin level). Body weight and height were measured. All patients responded to several questions in order to calculate the NST; nutritional status was assessed by BMI (8,9), MUST (10), NRS - 2002 (11), O-PNI (12) and CONUT (13). Disease activity was assessed by clinical and biological parameters and endoscopic scores. Quality of life was assessed by SIBDQ. To assess fC, a 2 grams stool sample was collected in a special fecal container and it was prelucreated using fluorometric enzyme immunoassay (FEIA). For endoscopic evaluation, a colonoscopy with ileoscopy was performed after adequate preparation of the bowel with sodium picosulfate and endoscopic scores were calculated by two experienced endoscopists.

Statistical analysis

The statistical analysis was performed using the program IBM SPSS Statistics 23. Summary statistics for continuous variables are presented as mean ± standard deviation (SD) and for categorical variables are presented in absolute frequency for each category.

Spearman rank correlation test was used both for correlations between ordinal variables and for the correlations between ordinal variables and interval variables (the latter being first transformed into rank order values). A p value < 0.05 was considered statistically significant. A value of rho < 0.3 indicated a weak correlation, 0.3 - 0.7 moderate correlation, and rho > 0.7 indicated a strong correlation (14).

Ethical considerations

Ethical protocols of the current study were reviewed and approved by Ovidius University of Constanta Ethics Committee. All patients were explained about the aims of the study and the ways of gathering information. Written consent was obtained from all the patients before recruitment to the study.

RESULTS

From 110 patients with IBD admitted in our hospital during this period, 22 patients were in remission and were excluded. In total, 50 patients with Crohn's disease and 38 patients with ulcerative colitis were eligible for our study. Baseline patient

characteristics are illustrated in table I. In our study, median age for CD and UC patients was 40.4 years (min = 19, max = 68) and 42.5 years (min = 16, max = 72), respectively. Regarding clinical and endoscopic activity, among CD and UC patients, more than 80% of patients presented moderate or severe disease activity. Half of the IBD patients were underweight. According to MUST score, 30 (60%) of CD patients and 25 (66%) of UC patients had a medium risk of malnutrition. According to NRS-2002 and O-PNI, three quarters of IBD patients were classified as being at risk for malnutrition. According to CONUT, half of CD and UC patients had mild malnutrition. Mean score of SIBDQ for CD and UC patients was low, 24 and 26, respectively.

Table I Baseline patient characteristics.

CHARACTERISTICS	CD (n = 50)	UC (n = 38)
Male/female, n	26 / 24	22 / 16
Age (years)*	40.4 +/- 19.2	42.5 +/- 19.4
CDAI (mild/moderate/severe), n	8 / 28 / 14	
SES-CD (mild/moderate/severe), n	8 / 30 / 12	
Partial Mayo score (mild/moderate/severe), n		7 / 22 / 9
Endoscopic Mayo score (mild/moderate/severe), n		3 / 20 / 15
Fecal Calprotectin (mg/kg)*	1550 +/- 980	1750 +/- 1090
BMI (kg/m2) (underweight/normal/overweight/obesity), n	(27/14/6/3)	(19/10/8/1)
Albumin (mg/dl)*	2.2 +/- 1.4	2.5 +/- 1.1
MUST (low/medium/high risk), n	18 / 30 / 12	5 / 25 / 8
NRS-2002 (without/with risk), n	12 / 38	10 / 28
O-PNI (without/with risk), n	18 / 32	12 / 26
CONUT (normal/mild/moderate/severe malnutrition), n	16 / 24 / 7 / 3	15 / 19 / 3 / 1
SIBDQ*	24 +/- 17	26 +/- 19

*Mean +/- SD

Correlations between disease activity and nutritional status assessed by different NST

Correlations between disease activity and nutritional status in CD are illustrated in Table II. In CD patients, CDAI best correlated with albumin ($r = -0.74$). We observed amoderate correlation with BMI ($r = -0.68$), O-PNI ($r = -0.62$), CONUT ($r = 0.61$) and NRS-2002 ($r = 0.61$), and a weak correlation with MUST score ($r = 0.27$). SES - CD had a moderate correlation with albumin ($r = -0.67$), O - PNI ($r = -0.61$), MUST ($r = 0.52$) and NRS-2002 ($r = 0.50$), and a weak and statistically insignificant correlation with BMI ($r = -0.28$) and CONUT ($r = 0.26$). We also explored the correlations between fC and NST and we observed a strong correlation with albumin ($r = -0.72$), moderate correlation with BMI ($r = 0.42$), O-PNI ($r = 0.38$), MUST ($r = 0.32$) and NRS-2002 ($r = 0.30$) and weak correlation with CONUT ($r = 0.20$).

Table II Correlations between disease activity (assessed by clinical, endoscopic and biological parameters) and nutritional status (assessed by different NST) in CD patients.

CD Spearman correlation, rho (p value)	Albumin	BMI	MUST	NRS-2002	O-PNI	CONUT
CDAI	-0.74 §	-0.68 §	0.27 §	0.61 §	-0.62 §	0.61 §
SES-CD	-0.67 §	-0.28 †	0.52 §	0.50 §	-0.61 §	0.26 †
fC	-0.72 §	0.42 §	0.32 §	0.30 §	0.38 §	0.20 †

§ p < 0.05

† p > 0.05

Correlations between disease activity and nutritional status in UC are illustrated in Table III. In UC patients, partial Mayo

score had strong correlation with BMI ($r = - 0.71$) and moderate correlation with albumin ($r = - 0.67$), O-PNI ($r = - 0.54$), CONUT ($r = 0.54$) and MUST score ($r = 0.53$). There was a weak correlation between partial Mayo score and NRS - 2002 ($r = 0.29$). Mayo endoscopic score showed a strong correlation with albumin ($r = - 0.76$) and moderate correlation with O-PNI ($r = - 0.63$) and CONUT ($r = - 0.50$). In contrast, there was a statistically insignificant correlation between Mayo endoscopic score and BMI ($r = - 0.27$), NRS-2002 ($r = 0.23$) or MUST ($r = 0.22$). Regarding correlations between fC and NST in UC patients, similar to CD patients, best correlation was observed with albumin ($r = - 0.69$).

Table III Correlations between disease activity (assessed by clinical, endoscopic and biological parameters) and nutritional status (assessed by different NST) in UC patients.

UC Spearman correlation, rho (p value)	Albumin	BMI	MUST	NRS-2002	O-PNI	CONUT
Partial Mayo score	-0.67§	-0.71 §	0.53§	0.29§	-0.54§	0.54§
Endoscopic Mayo score	-0.76§	-0.27†	0.22†	0.23†	-0.63§	-0.50 §
fC	-0.69§	0.38§	0.36§	0.31§	0.45§	0.11 †

§ p < 0.05

† p > 0.05

Correlations between QoL and NST

Correlations between SIBDQ and NST in IBD patients are illustrated in Table IV.

In CD patients, SIBDQ was strongly correlated with BMI ($r = 0.72$). We observed moderate correlations with NRS - 2002 ($r = - 0.58$), MUST ($r = - 0.51$), albumin ($r = 0.45$) and O-PNI ($r = 0.40$). An insignificant weak correlation between SIBDQ and CONUT was found ($r = - 0.11$).

In UC patients, SIBDQ was moderately correlated with MUST score ($r = - 0.58$), albumin ($r = 0.51$), BMI ($r = 0.50$) and NRS - 2002 ($r = - 0.49$). A weak correlation between SIBDQ and O-PNI ($r = 0.26$) and CONUT ($r = - 0.18$) was found.

Table IV Correlations between SIBDQ and NST in IBD patients.

NST	SIBDQ, Spearman correlation, rho (p value)	
	CD	UC
Albumin	0.45 §	0.51 §
BMI	0.72§	0.50 §
MUST	-0.51 §	-0.58 §
NRS-2002	-0.58 §	-0.49 §
O-PNI	0.40 §	0.26 §
CONUT	-0.11 †	-0.18 §

§ p < 0.05

† p > 0.05

DISCUSSION

In IBD, the severity of malnutrition depends on several factors like: disease activity, duration and disease extension or magnitude of the inflammatory response which drives catabolism; patients with CD are at risk even when the disease is quiescent, whereas UC patients are at risk for malnutrition when the disease is active (15).

As a general observation, we found that albumin levels had a strong or moderate negative correlation with clinical activity in both diseases. The majority of the patients had a CDAI > 220 or partial Mayo score > 5 which means a moderate or severe

active disease; albumin is also a negative acute phase protein and decreased values could mainly reflect acute disease and not protein energy malnutrition (15). In addition, in our study, albumin also had a strong or moderate negative correlation with endoscopic scores in both diseases, supporting the above hypothesis.

This is a reason why simple measures like BMI and unintentional weight loss, changes in recent nutrient intake (items that are explored by MUST or NRS - 2002) are more appropriate to assess the real protein energy malnutrition (16). However, inflammation is a risk factor for malnutrition, and albumin, either alone or as a part of other nutritional indexes like O-PNI or CONUT, may be used as a non-specific marker of malnutrition (17).

There are several studies which proved the hypothesis that patients who suffer from gastrointestinal malignancies or IBD have a more pronounced level of malnutrition; one of the studies investigated other nutritional tools such as Subjective Global Assessment (SGA), anthropometric measurements and biochemical markers among hospitalized patients with various gastrointestinal diseases and found a prevalence of malnutrition of 45.7% (18). A multicentric Romanian study conducted by Gheorghe C *et al*, who investigated malnutrition using NRS - 2002 and BMI and found a prevalence of malnutrition on admission of 30.6% in IBD patients (19).

Disease activity and NST

In our study, the majority of NST was correlated with disease activity assessed by CDAI score or partial Mayo score. According to literature (20,21)the role of MUST score or NRS - 2002 in predicting outcome in patients with IBD had already been investigated and we found similar results in our study. Rahman *et al*. found that MUST predicts disease activity in patients with CD (11).Controversly, Csontos *et al*. (22) reported that MUST is a useful nutritional screening tool in CD patients and in outpatient care, but insufficient to assess the nutritional status of high-risk patients and additional parameters like body composition analysis are required in this situation. Mijac D *et al* (23) analyzed nutritional status of 76 patients with active IBD using anthropometric measurements like skin fold measurement and mid-arm circumferences, BMI, unintentional weight loss and some blood tests including serum albumin and total cholesterol; they found that malnutrition prevalence in IBD patients ranged up to 70%. Few reports about nutritional indexes like O - PNI or CONUT in IBD (24) are available. To our knowledge, the present study is the first published in our region or country which explores nutritional status of IBD patients and its relationship with disease activity using MUST, NRS-2002, O-PNI and CONUT. Regarding the relationship between the nutritional status and the endoscopic activity, we found that endoscopic activity had a weak correlation with MUST in UC and a weak correlation with BMI in both diseases but correlated better with albumin, O-PNI and CONUT (notably, both indices include measurements of serum albumin as a component of their respective calculations), supporting once again the hypothesis that these indices could reflect the impact of the disease activity not the real nutritional status of the patients).

A lot of studies have proved the role of fC in evaluation of IBD activity, its role in follow-up or monitoring treatment response but there it's no data regarding the relationship with nutritional status. In our study, fC had a strong negative

correlation with albumin and moderate correlation with BMI, O-PNI, MUST and NRS - 2002.

SIBDQ AND NST

Literature is scarce regarding the relationship between nutritional status and QoL in IBD patients in our region. Norman *et al.* (25) assessed nutritional status by SGA, anthropometric measurements and bioelectrical impedance analysis, QoL by Medical Outcomes Study 36-item Short-Form General Health Survey (SF 36), muscle function by hand grip strength and peak flow and found that malnourished patients suffered significantly impaired QoL. Studies have shown the negative impact of malnutrition on QoL in other diseases like cancer (26,27), elderly patients (28) or patients on hemodialysis (29). At present there is insufficient information on QoL in relation to nutritional status in IBD. To our knowledge, the present study is the first to report a relationship between nutritional status and QoL using MUST, NRS - 2002, O-PNI and CONUT in IBD patients from our country. Our study found that the impact of clinical disease activity is accurately reflected in the nutritional status and QoL of IBD patients. Interestingly, we found that malnourished patients or patients at risk for malnutrition (evaluated by NST) had an impaired QoL and lower scores of SIBDQ. In our study, BMI, MUST, NRS - 2002 and albumin had strong or moderate correlations with SIBDQ. These scores combined with SIBDQ could predict the severity of the disease in both CD and UC.

One possible limitation of our study could be that the majority of the enrolled patients presented moderate or severe disease and patients in remission were excluded and it is difficult to interpret the results and reliably differentiate between the effects of active disease and the effects of malnutrition on QoL, since they are in a close relationship.

CONCLUSION

Malnutrition is common in IBD. Disease activity is reflected on the nutritional status of the patients and this impairs QoL. The study opens the perspective of assuming that influencing the nutritional status of patients suffering from IBD by appropriate nutritional treatment measures, this could be reflected in the increased QoL of these patients.

Our study is one of the few who reports that BMI, MUST, NRS - 2002, O-PNI, CONUT and albumin are useful, simple and convenient NST which correlates with disease activity and QoL in IBD patients from our country.

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