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PREVALENCE AND DETERMINANTS OF MALNUTRITION RISK IN CROHN'S DISEASE: A FOCUS ON ANTHROPOMETRIC AND CLINICAL CORRELATES.

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Abstract

Background: Malnutrition is common in Crohn's disease, negatively impacting prognosis and contributing to various disease-related complications. The aim of our study was to assess the risk of malnutrition in these patients and to investigate its potential association with anthropometric parameters, clinical factors, and dietary restrictions. **Materials and Methods:** A cross-sectional study was conducted among patients with Crohn's disease at department "C" Gastroenterology Department of Ibn Sina Hospital from November 2024 to April 2025. All participants underwent a consultation that included a clinical interview, anthropometric measurements using bioelectrical impedance analysis, and scoring assessments. The Saskatchewan IBD-NR score was used to evaluate malnutrition risk. Collected data were compiled in an Excel database, and a statistical analysis was performed. **Results:** A total of 159 patients with Crohn's disease were included, with a mean age of 42.2 ± 13.4 years and a male-to-female ratio of 0.59. Among them, 47.7% (74) were in an active disease phase, and 23.2% (44) were underweight. Dietary restrictions were reported by 104 patients (65.4%), while 38.7% (60) were found to have a high risk of malnutrition. A significant association was observed between a high risk of malnutrition and disease activity ($p < 0.001$), dietary restriction ($p < 0.001$), as well as FFMI ($p = 0.048$), FMI ($p < 0.001$), and BMI ($p < 0.001$). **Conclusion:** These findings highlight the significant relationship between disease activity, body composition, dietary practices, and the risk of malnutrition, emphasizing the need for comprehensive medical and nutritional management of patients with Crohn's disease.

Keywords: Crohn's disease, inflammatory bowel diseases, malnutrition, nutritional assessment, risk of malnutrition, Saskatchewan IBD nutritional risk.

Introduction

Crohn's disease (CD) is a chronic inflammatory bowel disease (IBD) that can affect any part of the gastrointestinal tract from the mouth to the anus. Consequently, alterations in body composition [1] and malnutrition [2] are common complications. According to the European Society for Clinical Nutrition and Metabolism (ESPEN), malnutrition is defined as "a state resulting from a deficiency or insufficient intake of nutrients, leading to changes in body composition [reduced fat-free mass (FFM) or cell mass], causing impaired physical and mental function and negatively affecting clinical outcomes of diseases" [3].
In the context of CD, malnutrition arises from reduced food intake due to loss of appetite, hospitalization, or prolonged dietary restrictions [4]. It can also be caused by maldigestion, malabsorption, bleeding, and interactions between medication and food [4]. The prevalence of malnutrition is high among these patients [5], who are more susceptible to developing protein-energy malnutrition [6] than the general population. Therefore, nutritional status assessment is essential for optimal disease management [7].
Several methods exist to evaluate malnutrition risk. These include general population tools such as the Subjective Global Assessment (SGA), Nutritional Risk Index (NRI), Onodera's Prognostic Nutritional Index (PNI), Controlling Nutritional Status score (CONUT) score, Nutritional Risk Screening 2002 (NRS 2002), and the Malnutrition Universal Screening Tool (MUST). Specific tools for IBD patients include the Saskatchewan Inflammatory Bowel Disease Nutritional Risk (Sask IBD-NR) and

the Inflammatory Bowel Disease Nutrition Self-screening Tool (IBD NST) [7]. In Morocco, there is a lack of data regarding the prevalence of patients at risk of malnutrition, highlighting the relevance of this study.
Given that BMI alone is insufficient to detect malnutrition risk [5], we chose to assess FFM and FM, which provide a more reliable measure of an individual's nutritional status [8]. The objective of this study was to measure the risk of malnutrition in patients with CD and to investigate its possible association with anthropometric and clinical parameters.

Materials and methods

The methodology of this study has been partially described previously in our earlier publication [9]. The present article focuses on the same study framework; therefore, only the main methodological elements are recalled here.

Study design

This was a cross-sectional, descriptive, and analytical study conducted in the Hepato-Gastroenterology Department "department C" at Ibn Sina Hospital (HIS), part of the Ibn Sina University Hospital Center (CHUIS) in Rabat, Morocco. The study involved patients diagnosed with CD and was carried out between November 2024 and April 2025.

Setting

Ibn Sina Hospital (HIS) is a public tertiary care facility under the Ibn Sina University Hospital Center (CHUIS), located in Rabat, Morocco's capital city, with a population of approximately 2 million inhabitants. The hospital includes three hepatology and gastroenterology units: one focused on digestive exploration and outpatient care, and two others that also manage inpatient admissions, each with a capacity of 40 beds. This study was conducted in department "C" Hepato-Gastroenterology Department, which is dedicated to the diagnosis, treatment, and long-term follow-up of patients with hepatic and digestive disorders, including CD. A weekly clinic specifically addresses inflammatory bowel diseases (IBD). Since its establishment in the 1980s, the department has provided care for 1,217 patients diagnosed with CD.
Further details regarding the study design and setting have been reported previously [9].

Patients

- Inclusion criteria: The patients included in this study were adults with CD aged between 18 and 70 years, diagnosed at least six months prior, either in an active phase or remission, and who had undergone surgery or not.
- Exclusion criteria: Patients at risk of malnutrition due to other medical conditions were excluded, such as those with small bowel stoma, severe psychiatric disorders, or other chronic diseases like cancer, celiac disease, pernicious anemia, renal or cardiac failure, hepatitis B and C, HIV, dermatological diseases, pregnant or breastfeeding women, and those who refused to participate in the study.
- The diagnosis of CD was based on clinical signs (such as abdominal pain, chronic diarrhoea, weight loss, fatigue), radiological and biological examinations **(**fecal calprotectin, C-reactive protein**)**, as well as endoscopy with histopathological analysis [10, 11].
- CD in remission is defined by the absence of clinical symptoms, endoscopic remission with mucosal healing, and normalization of inflammatory biological markers [12]. An active flare of CD is characterized by a symptomatic relapse in a patient previously in remission, confirmed by biological tests, endoscopic examinations, or imaging [13].

The eligibility criteria and disease definitions were comparable to those described in our previous study [9].

Data collection and assessment procedures

The consultation took place between the principal investigator and the patient, lasting approximately 20 to 30 minutes in a private room. It included a review of the medical record, an interview, and the collection of anthropometric measurements. During the interview, information was gathered on sociodemographic parameters (age and gender), clinical parameters (context of the consultation, reason and duration of hospitalization, disease activity measurement tool, and blood hemoglobin levels), anthropometric parameters (weight, height, body fat percentage, FM, FFM, BMI, FFMI, and FMI), and nutritional parameters (risk of malnutrition and dietary restrictions, such as whether the patient has limited the consumption of certain foods or food groups). Missing data were supplemented by consulting patient records in the CD registry of the department.
Height was measured using a stadiometer.
Disease activity was assessed using the Crohn's disease activity index (CDAI), a validated tool specifically developed by Best et al. for patients with Crohn's disease. A score below 150 indicated inactive disease, between 150 and 450 indicated active disease, and above 450 indicated severely active disease [14].
The Sask IBD-NR test was used to evaluate the risk of malnutrition. It is among the best tools for detecting malnutrition risk and is specifically

designed for patients with IBD. It is easy to use, reliable, and quick [15]. The questionnaire includes items on gastrointestinal symptoms, weight loss, and avoided foods [16]. Scores range from 0 to 7: 0–2 indicates low risk, 3–4 moderate risk, and 5–7 high risk of malnutrition [17]. The malnutrition risk score was calculated manually by summing the points for each question.

Since BMI alone is insufficient to assess nutritional status [18], body composition analysis was performed using a bioelectrical impedance analyzer (TANITA BC-313) operating at 50 kHz, suitable for adults aged 18 to 90 years. This device measures weight, BMI, body fat percentage, visceral fat, and muscle mass reliably through a small electrical current passing through the body [19]. Measurements were taken once per patient with electrodes properly positioned. To ensure accuracy, patients were asked to fast for at least two hours, have an empty bladder, and remove heavy clothing and shoes before stepping on the device. The device was calibrated with the patient's birth date, gender, height, and physical activity status.

Fat-free mass, which is not directly provided by the impedance meter, was calculated from body fat percentage and weight using the following formula [20, 21]:

- FFM = Body weight × (1 − (% body fat / 100))
- FFMI and FMI were calculated as follows:
- FFMI=fat-free mass/ height² (kg/m²)
- FMI = Fat mass / height² (kg/m²)

Table I shows the normal values for body components according to Kyle et al. [8]:

Table I: Reference standards for FFMI and FMI

	Low	Normal	High	Very High
FFMI in men (kg/m²)	< 16.6	16.7 – 19.7	19.8–21.6	> 21.6
FFMI in women (kg/m²)	< 14.5	14.6–16.7	16.8–18.1	> 18.1
FMI in men (kg/m²)	< 1.7	1.8–5.1	5.2–8.2	> 8.2
FMI in women (kg/m²)	< 3.8	3.9–8.1	8.2–11.7	> 11.7

FFMI: Fat-Free Mass Index
FMI: Fat Mass Index

Reference values for BMI = Weight / height² (kg/m²)) were based on WHO standards. A BMI < 18.5 kg/m² indicated underweight, a BMI between 18.5 and 24.9 kg/m² indicated normal weight, a BMI between 25 and 29.9 kg/m² indicated overweight, and a BMI ≥ 30 kg/m² indicated obesity.

The nutritional assessment procedures followed the same methodology as previously published [9].

All collected data were systematically compiled and organized using Excel via Epi Info software version 7.2.6.0 to ensure accurate data management and facilitate subsequent statistical analysis.

Statistical analysis

Descriptive statistics: Qualitative variables were summarized as counts and percentages. Quantitative variables were described according to their distribution, using either mean ± standard deviation or median [interquartile range].

Analytical statistics: Correlations between scores were assessed using Pearson's or Spearman's correlation coefficients. Associations between qualitative variables were tested using the Chi-square test when validity conditions were met; otherwise, Fisher's exact test was applied. All analyses were conducted using Jamovi software version 2.6.44.

Ethical considerations

After recruitment, patients were asked to provide informed consent and were informed about the study's objectives, investigators, and the questionnaire process. Data collection was conducted respecting the dignity, privacy, and confidentiality of patient information in accordance with the Declaration of Helsinki. All eligible patients who consented were included in the study.

The Biomedical Research Ethics Committee of Mohammed V University in Rabat approved the study under approval number 149/24.

Results

Study population

During the study period, 184 patients with CD were recruited. Ultimately, data from 159 patients were analyzed. The mean age of the study population was 42.4 ± 13.4 years, with a male-to-female ratio of 0.59. Among these patients, 12.58% were evaluated during hospitalization, 39.62% during outpatient consultations, and 47.8% during their treatment administration in the day hospital. The majority of hospitalized patients (63%) were admitted due to disease exacerbation. Regarding hemoglobin levels, 74.7% of patients had normal levels, while 23.4% presented with levels below the normal range (Table II).

Table II: Sociodemographic and clinical characteristics (n = 159)

Variables	n=159
Age (years)*	42.4 ± 13.4
gender **	
Male	59 (37.1)
Female	100 (62 .9)
Type of patient encounter**	
Outpatient consultation	63 (39 .62)
Hospitalization	20 (12.58)
Day hospital care	56 (47.80)
Reason for hospitalization**	
Disease exacerbation	17 (63)
Disease complications	5 (18.5)
Routine monitoring	5 (18.5)
Duration of hospitalization**	
Less than one week	2 (7.4)
1 to 2 weeks	18 (66.7)
3 to 4 weeks	2 (7.4)
5 weeks or more	5 (18.5)
CDAI score***	136.3 [36.5 – 232]
Disease activity**	
Inactive Crohn’s disease	81(52.3)
Active Crohn’s disease	69 (44.5)
Severe Crohn’s disease	5 (3.2)
Hemoglobin level (g/dl) **	
Below normal	37 (23.4)
Normal	118 (74.7)
Above normal	3 (1.9)

* Expressed as mean ± standard deviation
** Expressed as number (%)
*** Expressed as median [interquartile range]
CDAI : Crohn’s Disease Activity Index

A normal BMI was observed in 48.1% of patients, while 20.9% had underweight, 22.8% were overweight, and 8.2% were classified as obese. The percentage of body fat was within the normal range in 44.9% of patients and was considered low in 22.1%. Regarding the FMI, 46.7% of patients had normal values, 19.7% had a low FMI, 24.1% had a high FMI, and 9.5% had a very high FMI. As for the FFMI, 21.2% of patients had a low FFMI, 53.3% had normal values, 16.8% had a high FFMI, and 8.8% had a very high FFMI.
According to the Sask IBD-NR score, 43.2% of patients were classified as having a low risk of malnutrition, 18.1% had a moderate risk, and 38.7% had a high risk of malnutrition. Additionally, 65.4% of patients reported engaging in dietary restrictions. More detailed results are provided in Table III.

Table III: Anthropometric and nutritional characteristics (n = 159)

Variables	n=159
Weight (kg) *	63 ± 13.5
Height (m) ***	1.66 [1.60-1.73]
BMI (Kg/ m²) **	22.7 ± 5
BMI (kg/ m²) **	
Underweight	33 (20.9)
Normal weight	76 (48.1)
Overweight	36 (22.8)
Obesity	13 (8.2)
Fat mass (%) ***	24,1 [14.7- 34.2]
Fat mass (%) **	
Lean	30 (22.1)
Normal	61 (44.9)
Overweight	29 (21.3)
Obesity	16 (11.8)
Fat mass (Kg) ***	15.05 [8.3-23.5]
FMI (kg/m²) ***	5.2 [2.9-8.7]

FMI (kg/m²) **	
Low	27 (19.7)
Normal	64 (46.7)
High	33 (24.1)
Very high	13 (9.5)
FFM (Kg) ***	45.1 [41.4-52.7]
FFMI (kg/m²) *	46.7 ± 8.5
FFMI (kg/m²) **	
Low	29 (21.2)
Normal	73 (53.3)
High	12 (8.8)
Very high	23 (16.8)
Total Saskatchewan score ***	3 [2-6]
Saskatchewan IBD-NR test **	
Low malnutrition risk	67 (43.2)
Moderate malnutrition risk	28 (18.1)
High malnutrition risk	60 (38.7)
Dietary restriction **	
No	55 (34.6)
Yes	104 (65.4)

* Expressed as mean ± standard deviation
** Expressed as number (%)
*** Expressed as median [interquartile range]

BMI: Body Mass Index
FFMI: Fat-Free Mass Index
FMI: Fat Mass Index

Associations between malnutrition risk and clinical, anthropometric, and biological parameters

A highly significant association was found between the context of patient encounters and the risk of malnutrition ($p = 0.002$). Among hospitalized patients, 65% were classified as having a high risk of malnutrition. Conversely, patients attending the hospital for outpatient consultations or day-hospital treatments had a lower risk, with 50.8% and 47.4% respectively falling into the low-risk category. Additionally, a high risk of malnutrition was observed in patients hospitalized due to disease exacerbation (70.6%) or complications (80%).
Age: Younger patients were more likely to present a higher risk of malnutrition (r = -0.76, $p = 0.028$) (Figure1 (a)).
Weight: Patients with lower body weight were significantly more likely to be at risk of malnutrition (r = -0.334, $p < 0.001$) (Figure1 (b)).
BMI: A strong association was observed between BMI and malnutrition risk (r = -0.380; $p < 0.001$). Patients classified as obese (53.8%), overweight (23.6%), or having a normal BMI (43.2%) were predominantly in the low-risk category. In contrast, 65.6% of underweight patients were at high risk (Figure1(c)).
FMI: A highly significant association was noted between FMI and malnutrition risk (r = -0.290; $p < 0.001$). Patients with low FMI had a higher malnutrition risk (76.9%), whereas those with elevated or very high FMI were more likely to have a low risk, at 54.5% and 46.2% respectively (Figure1(d)).
FFMI: A significant association was found between FFMI and malnutrition risk (r = -0.273; $p = 0.048$). Patients with high (52.2%) or very high FFMI (58.3%) were more likely to have a low risk of malnutrition, whereas those with low (60.7%) or normal FFMI (43.3%) exhibited a higher risk (Figure1(e)).
Patients with low BMI, FFMI, and FMI values were at greater risk of malnutrition, while those with high or very high indices had a lower risk.
Hospitalization: Among hospitalized patients, 65% were at high risk of malnutrition, a statistically significant association ($p = 0.002$). Specifically, 70.6% of those hospitalized for disease exacerbation had a high malnutrition risk.
Disease activity and stool consistency: Patients with active disease or severe activity were more frequently at high risk of malnutrition, at rates of 64.7% and 80% respectively. The association between disease activity and malnutrition risk was highly significant ($p < 0.001$). Similarly, patients with diarrhea exhibited a 70.4% rate of high malnutrition risk, with a significant association found between stool consistency and malnutrition risk ($p < 0.001$).
Disease duration: A weak but significant inverse correlation was observed between disease duration and malnutrition risk (r = -0.210; $p = 0.010$), indicating that patients with longer disease duration tended to have a lower malnutrition risk (Figure1 (f)).
Dietary restrictions: Out of 159 patients, 104 (65.4%) reported engaging in dietary restrictions. A highly significant association was found between malnutrition risk and dietary restriction ($p < 0.001$).
Hemoglobin levels: All patients with elevated hemoglobin levels (100%) and 49.1% of those with normal levels were classified as low risk. Conversely, 51.4% of patients with low hemoglobin levels had a high malnutrition risk. The association between hemoglobin level and malnutrition risk was highly significant ($p = 0.002$).
Further details are provided in Tables IV and V, and illustrated in Figure1.

Table IV: Association between malnutrition risk and sociodemographic and clinical variables

Variables	Risk of malnutrition			*p*
	Low malnutrition risk	Moderate malnutrition risk	High malnutrition risk	
Gender **				0.810
Female	40 (41.2)	18 (18.6)	39 (40.2)	
Male	27 (46.6)	10 (17.2)	21 (36.2)	
Patient encounter**				0.002
Outpatient visit	30 (50.8)	9 (15.3)	20 (33.9)	
Hospitalized	1 (5)	6 (30)	13 (65)	
Day hospital	36 (47.4)	13 (17.1)	27 (35.5)	
Reason for hospitalization**				0.215
Disease exacerbation	1 (5.9)	4 (23.5)	12 (70.6)	
Control	0 (0)	3 (0)	2 (40)	
Disease complication	1 (20)	0 (0)	4 (80)	
Socioeconomic status**				0.183
Low	40 (44.4)	14 (15.6)	36 (40)	
Middle	22 (37.7)	14 (23.7)	23 (39)	
High	4 (100)	0 (0)	0 (0)	
Disease location**				0.203
Ileal	4 (22.2)	5 (27.8)	9 (50)	
Ileocolonic	43 (42.6)	17 (16.8)	41 (40.6)	
Colonic	18 (54.5)	6 (18.2)	9 (27.3)	
CDAI**				< 0.001
Inactive CD	51 (63.7)	17 (21.3)	12 (15)	
Active CD	14 (20.6)	10 (14.7)	44 (64.7)	
Severe CD	0 (0)	1 (20)	4 (80)	
Stool consistency**				< 0.001
Normal	45 (52.9)	17 (20)	23 (27.1)	
Constipation	6 (50)	2 (16.7)	4 (33.3)	
Soft	11 (55)	1 (50)	8 (40)	
Very soft	1 (100)	4 (40)	5 (50)	
Diarrhea	4 (14.8)	4 (14.8)	19 (70.4)	
Hemoglobin level**				0.002
Below normal	7 (18.9)	11 (29.7)	19 (51.4)	
Normal	56 (49.1)	17 (14.9)	41 (36)	
Above normal	3 (100)	0 (0)	0 (0)	

** Expressed as number (percentage)
CDAI: Crohn's Disease Activity Index

Table V: Association between malnutrition risk and various anthropometric and nutritional variables

Variables	Risk of malnutrition			p
	Low malnutrition risk	Moderate malnutrition risk	High malnutrition risk	
FFMI **				
Low	7 (25)	4 (14.3)	17 (60.7)	0.048
Normal	31 (43.1)	10 (13.9)	31 (43.1)	
High	12 (52.2)	6 (26.1)	5 (21.7)	
Very high	7 (58.3)	3 (25)	2 (16.7)	
BMI **				
Underweight	5 (15.6)	6 (18.8)	21 (65.6)	< 0.001
Normal weight	32 (43.2)	11 (14.9)	31 (41.9)	
Overweight	23 (23.6)	6 (16.7)	7 (19.4)	
Obesity	7 (53.8)	5 (38.5)	1 (7.7)	
FMI **				
Low	4 (15.4)	2 (7.7)	20 (76.9)	< 0.001
Normal	29 (46)	9 (14.3)	25 (39.7)	
High	18 (54.5)	7 (21.2)	8 (24.2)	
Very high	6 (46.2)	5 (38.5)	2 (15.4)	
Dietary restriction **				
No	38 (73.1)	5 (9.6)	9 (17.3)	< 0.001
Yes	29 (28.2)	23 (22.3)	51 (49.5)	

** Expressed as number (percentage)
BMI: Body Mass Index
FFMI: Fat-Free Mass Index
FMI: Fat Mass Index

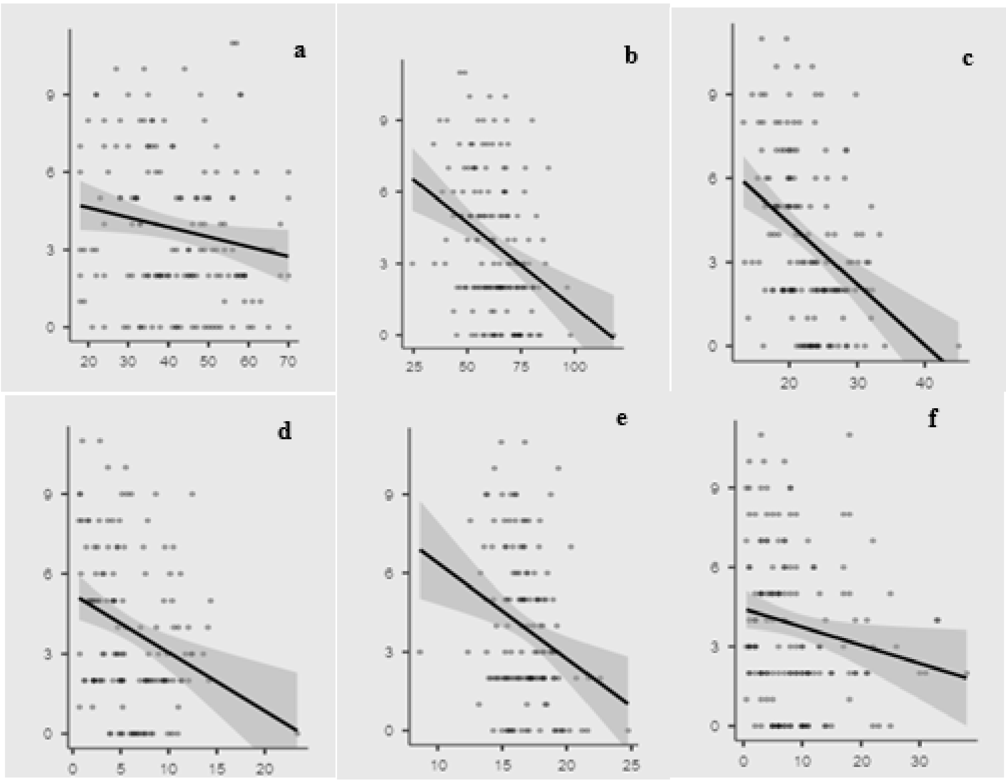

Figure 1: Correlations between various quantitative variables

- a: Correlation between malnutrition risk score and age
- b: Correlation between malnutrition risk score and weight
- c: Correlation between malnutrition risk score and BMI
- d: Correlation between malnutrition risk score and FMI
- e: Correlation between malnutrition risk score and FFMI
- f: Correlation between malnutrition risk score and disease duration since diagnosis

Discussion

To our knowledge, few or no studies in Morocco have assessed the association between the risk of malnutrition, as evaluated by the Sask IBD-NR tool, and anthropometric parameters in patients with CD. The aim of our study was to measure the risk of malnutrition in these patients and to investigate a possible association of this risk with dietary restrictions and anthropometric and clinical parameters.

Our results showed an unbalanced distribution of FM and FFM percentages in the body composition of our study population. Both FMI and FFMI were imbalanced, with nearly one-fifth of patients presenting low FMI, low FFMI, and underweight, most of whom had a high risk of malnutrition. We also observed that younger patients and those with lower body weight had a higher risk of malnutrition. Indeed, our findings are consistent with those of Peng et al., who found in univariate analysis that malnourished men were younger than those in good nutritional status, and that women were more affected by severe malnutrition from a younger age [22]. Similarly, Liu et al. reported that younger age was linked to malnutrition in univariate analysis [23]. These observations were explained by Ciocîrlan et al., who suggested that earlier disease onset leads to a delayed diagnosis, resulting in nutritional deficiencies [24]. Papadimitriou et al. also highlighted that women have lower nutrient intake compared to men, lower FFM, hormonal variations, and a poorer response to certain treatments [25].

Moreover, Bian et al. noted that low BMI and FFMI are often associated with CD, even when patients have adequate nutritional intake. Once malnutrition is established, whether moderate or severe, it leads to a general alteration of body composition [26]. Similarly, Sandall et al., through a narrative review, found that CD patients typically have lower FM, FFM, and BMI [27]. Lomer reported that up to 80% of patients may experience weight loss and 85% may suffer from malnutrition [28]. In our study, as in that of Varma et al. [29], more than half of the patients practiced dietary restrictions. Weight loss is commonly observed in CD, whether the disease is in remission or active [30]. This weight loss can result from dietary restrictions due to loss of appetite, personal beliefs, or during disease flares to prevent exacerbations and associated complications like abdominal pain, diarrhea, malabsorption, bloating, and weight loss [2,31]. Additionally, patients may restrict their diet in an attempt to mitigate clinical symptoms of the disease [28]. Such restrictions, compounded by the disease itself, disrupt normal anthropometric values and increase the risk of malnutrition [2].

Malnutrition is also caused by disease activity [33], and once established, it is associated with disease activity and low BMI, as indicated by Pulley et al. [34]. Furthermore, disease activity correlates with a decrease in body fat percentage [20]. In our study, more than half of the patients were in a flare, most of whom were experiencing severe disease activity, and both groups had a high risk of malnutrition.

The association between malnutrition risk and disease activity observed in our results suggests that disease flares play a significant role in elevating malnutrition risk. Consequently, preventing flares is crucial to avoiding one of the primary causes of malnutrition development.

Additionally, we found a significant inverse correlation between malnutrition risk and disease duration, indicating that malnutrition risk tends to decrease as the disease becomes more longstanding. Our findings align with Liu et al., who observed that malnutrition was more common among patients with recent disease onset [23]. This could be explained by patients' adaptation over time to their condition and improved medical and nutritional management. Furthermore, our study demonstrated a strong association between malnutrition risk and low hemoglobin levels. We also identified a significant correlation between decreased hemoglobin and higher CDAI scores. These findings are in line with those of Prieto et al., who reported lower iron levels in patients during active phases of the disease [31], and Benjamin et al., who observed reduced hemoglobin concentrations during disease flares [35]. Anemia is a well-documented complication of CD [36], resulting from disease activity, gastrointestinal bleeding, and chronic inflammation [37]. This relationship suggests that active disease phases contribute to worsening nutritional status through the onset of anemia.

In addition, Li et al. highlighted that hospitalized patients with IBD exhibit a higher prevalence of malnutrition compared to those treated in outpatient settings [17]. Similarly, in our study, over half of the hospitalized patients were at high risk of malnutrition, underscoring the importance of systematic nutritional assessments at the time of hospital admission.

Strengths of the study: This is the first Moroccan study that simultaneously evaluated multiple parameters—anthropometric and clinical—in association with malnutrition risk in CD patients. It also allowed for an in-depth analysis of body composition. Furthermore, we used a validated malnutrition risk assessment tool specifically designed for IBD patients, yielding more relevant results.

Our study was limited by the available equipment, as we used bioelectrical impedance analysis (BIA) rather than more precise tools like Dual-Energy X-ray Absorptiometry (DEXA) [38]. Additionally, the study was monocentric, and dietary habits vary across regions, which could affect generalizability.

Future directions: It would be beneficial to develop a malnutrition screening tool specifically for CD. A longitudinal cohort study with anthropometric follow-up and nutritional education is also warranted. Given the relapsing-remitting nature of the disease, future studies should assess nutritional status during both flare-ups and remission periods.
At the end of our assessments, most patients received nutritional education. It would be ideal to re-evaluate their anthropometric parameters and malnutrition risk in follow-up consultations to monitor improvements.
Our findings highlight the need for a more precise evaluation of nutritional status, as weight gain and BMI alone are insufficient for effective nutritional follow-up. The use of more advanced diagnostic equipment would greatly enhance the accuracy of nutritional assessments.

Conclusion

Our findings demonstrated a significant association between malnutrition risk and several clinical and anthropometric parameters. These results highlight the importance of comprehensive medical and nutritional consultations, including the assessment of the CDAI score, hemoglobin levels, anthropometric measurements, and nutritional risk screening, in order to prevent malnutrition. Furthermore, it appears essential to intensify research in the pharmacological field with the aim of preventing disease flares or prolonging remission periods.

AI use statement: This article was partially written with the assistance of artificial intelligence (Chat GPT, Open AI) for tasks including reformulation, language clarification, scientific writing optimization, and translation into English. All ideas, data analysis, and interpretation of results were conducted by the authors. The tool was not used to generate or analyze data, nor to make scientific decisions.

Ethical approval: Favorable approval was obtained from the Biomedical Research Ethics Committee affiliated with Mohammed V University, Faculty of Medicine and Pharmacy of Rabat, Morocco, under reference number 149/24. This ethics committee is registered with the U.S. Department of Health and Human Services' Office for Human Research Protections (OHRP) under the registration number IORG0006594 (http://ohrp.cit.nih.gov/search/search.aspx).

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