

How to Cite:

Ali, A., Shah, M., Shahzad, A., Khan, H. T., & Mahmood, R. (2023). Micronutrients deficiency among ulcerative colitis patients. *International Journal of Health Sciences*, 7(S1), 1111-1118. <https://doi.org/10.53730/ijhs.v7nS1.14325>

Micronutrients deficiency among ulcerative colitis patients

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Abstract---Background and Aim: Malnutrition is a significant concern in inflammatory bowel disease with incidence varied from 18% to 62% among ulcerative colitis (UC) patients. The purpose of the present study was to investigate the ulcerative colitis patients for micronutrient status. Patients and Methods: This prospective study was conducted on 56 ulcerative colitis patients in the Endoscopic Unit of Dr. Fida Painless & General Hospital, Peshawar for the duration from April 2022 to April 2023. Newly diagnosed ulcerative patients confirmed by colonoscopy and histopathology were enrolled. All the patients were divided into three different categories based on disease severity: Group-I (mild), Group-II (moderate), and Group-III (severe). Each individual underwent complete physical examination, laboratory investigations, and colonoscopy. Serum was obtained and tested for selenium, iron, copper, and magnesium levels. SPSS version 27 was used for data analysis. Results: Of the total 56 UC patients, there were 21 (37.5%) male and 35 (62.5%) female. The overall mean age was 34 years. Based on histopathological examination, the grading of disease severity were as follows: Group-I (mild) 4 (7.1%), Group-II (moderate) 28 (50%), and Group-III (severe) 24 (42.9%). UC patients group and healthy group had similarity in terms of age and gender. The UC group had significantly lower selenium, magnesium, and zinc

levels as compared to healthy individuals but had higher WBCs count than the control group. Both groups had homogenous copper and iron levels with no statistical significance. Conclusion: The present study observed that micronutrients must be examined in UC patients not only to guide supplementing decisions, but also to raise awareness that correcting these deficiencies, which limit immunological response, may assist remission.

Keywords---ulcerative colitis, malnutrition, micronutrients deficiency.

Introduction

Ulcerative colitis (UC) is an inflammatory bowel disease that affects both gender equally and is generally diagnosed between late teens and early adulthood [1-3]. UC has a direct impact on patients' quality of life and is linked to a variety of health issues, including toxic megacolon, strictures, and colorectal cancer [4, 5]. Diarrhea, stomach discomfort, rectal bleeding, weight loss, and lethargy are common symptoms of UC [6]. The clinical diagnosis of ulcerative colitis is obtained based on colonoscopy findings, histological investigation, and examination of stool for infectious causes [7]. UC causes inflammation and ulcers on the lining of the colon and rectum, often known as the large bowel [8]. Symptoms include ulcers and open lesions on the lining's surface, which may cause gastrointestinal bleeding, weight loss, and diarrhea [9]. Many individuals can experience difficulties outside of the colon, such as skin disorders, eye diseases, and musculoskeletal, hematopoietic, and coagulation system complications [10]. The etiology of UC is unknown, but research shows that a variety of variables, including genetics, immunological responses, and infectious processes, all interact [11]. Moreover, race, age, and geographic location can all have an influence on persons impacted by UC [12]. Lifestyles, smoking, dietary choices, and childhood illnesses all have a part in increasing the prevalence of UC.

Malnutrition is a significant concern among people with IBD, with prevalence varies from 18% to 62% among UC patients [13]. Micronutrient insufficiency can occur as a result of recurrent diarrhea, increased intestinal excretion, reduced food intake, inadequate nutritional support, bloody bowel movement, and pharmaceutical interactions [14]. Owing to bowel inflammation during elevated disease activity, dietary needs and habits may need to be altered to aid recovery and prevent bowel aggravation [15]. Smaller portions and lower levels of fibre and fatty meals are advised since they aggravate symptoms during illness flare-ups [16]. Insoluble fibre should be avoided when patients are undergoing therapy since it is indigestible and adheres to the colon's wall when inflamed [17]. Consequently, the purpose of this study was to investigate the UC patients for micronutrient status.

Methodology

This prospective study was conducted on 56 ulcerative colitis patients in the Endoscopic Unit of Dr. Fida Painless & General Hospital, Peshawar for the

duration from April 2022 to April 2023. Newly diagnosed ulcerative patients confirmed by colonoscopy and histopathology were enrolled. All the patients were divided into three different categories based on disease severity: Group-I (mild), Group-II (moderate), and Group-III (severe). Each individual underwent complete physical examination, laboratory investigations, and colonoscopy. Serum was obtained and tested for selenium, iron, copper, and magnesium levels. Those who had a colonoscopy for another reason, such as anemia, severe stomach pain, or chronic constipation, and had a normal mucosal pattern on histological analysis were categorized as healthy. Our clinical immunology laboratories conducted the laboratory investigations. A 5 mL of blood samples were taken from control and UC patients and clotted for 20 minutes in a plain tube. The blood samples were kept at 20 Celsius after centrifuging for 10 minutes at 2500 rpm. Serum copper, magnesium, selenium, iron, and zinc were determined. Colorimetric technique was used for measuring the zinc, iron, magnesium, and copper serum. ELIZA technique was used for measuring the selenium. SPSS version 27 was used to analyze the data.

Results

Of the total 56 UC patients, there were 21 (37.5%) male and 35 (62.5%) female. The overall mean age was 34 years. Based on histopathological examination, the grading of disease severity were as follows: Group-I (mild) 4 (7.1%), Group-II (moderate) 28 (50%), and Group-III (severe) 24 (42.9%). UC patients group and healthy group had similarity in terms of age and gender. The UC group had significantly lower selenium, magnesium, and zinc levels as compared to healthy individual but had higher WBCs count than control group. Both groups had homogenous copper and iron levels with no statistical significant. Baseline characteristics of both groups are compared in Table-I. Gender distribution is illustrated in Figure-1. UC patients' clinical features and histological findings are presented in Table-II. Disease severity based on histopathological examination is graded and depicted in Figure-2.

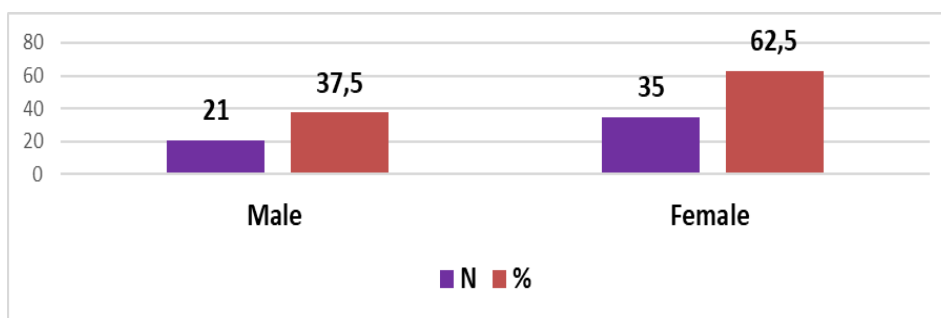


Figure-1 Gender distribution (n=56)

Table-I comparison of baseline characteristics

Variables	UC group (N=56)	Healthy group (N=30)	P-value
Age (years)	34 (20-45)	30 (25-35)	0.918
Gender N (%)			0.426

Male	21 (37.5)	10 (33.3)	
Female	35 (62.5)	20 (66.7)	
WBCs count (10^3 per mm^3)	8.6 ± 2.8	6.7 ± 2.3	0.052
Hemoglobin (g/dl)	11.2 ± 1.9	11.5 ± 1.8	0.524
Platelet count ($\times 10^3$ per mm^3)	258 (205–295)	251 (181–280)	0.835
Serum selenium (pg/ml)	144.6 ± 56.6	534.1 ± 181	<0.001
Serum magnesium (mg/dl)	1.8 (1.7–2.0)	2 (1.9–2.1)	<0.001
Serum Zinc ($\mu\text{g}/\text{dl}$)	61.3 ± 16	75.8 ± 22.4	0.021
Serum copper ($\mu\text{g}/\text{dl}$)	86.8 ± 10.5	84.4 ± 11.8	0.411
Serum iron ($\mu\text{g}/\text{dl}$)	96.1 ± 36.8	102.3 ± 26.9	0.724

Table-II UC patients' clinical features and histological findings (N=56)

Variables	Value
Motion per day (frequency of stool)	4 (3-7)
Disease duration (months)	1 (1-2)
Categorical Characteristics N (%)	
Blood presence in stool	18 (32.2)
Weight loss occurrence	10 (17.9)
Abdominal pain	20 (35.8)
Histopathological findings	
Atypia	2 (3.6)
Cellular infiltrate	56 (100)
Cryptitis	56 (100)
Irregular shape of crypts	56 (100)
Crypt abscess	42 (75)

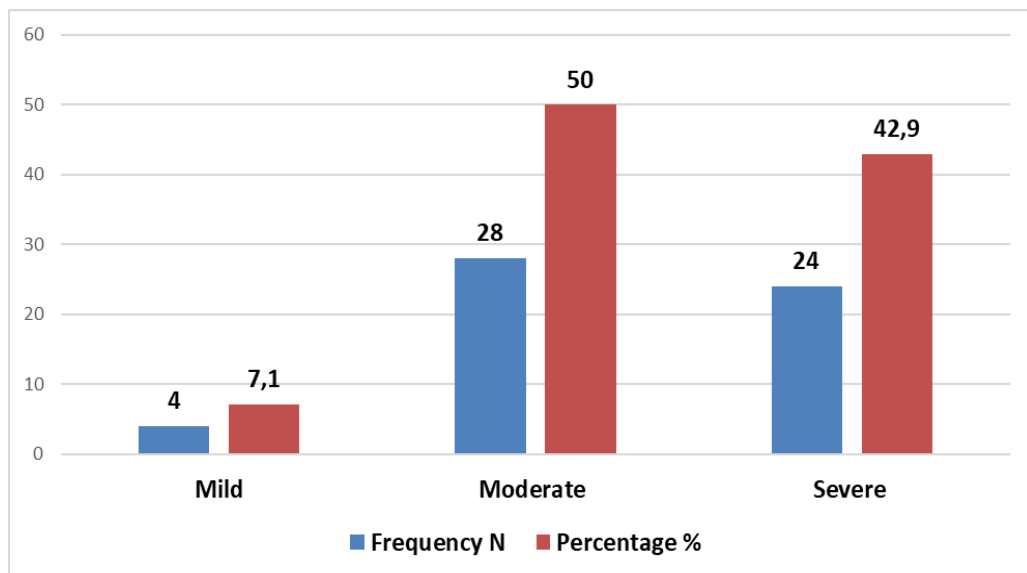


Figure-2 Grading of UC patients based on histopathological examination

Discussion

The present study mainly investigated 56 ulcerative colitis patients for micronutrients deficiency and found that Micronutrients should be examined in UC patients not only to guide supplementing decisions, but also to raise awareness that correcting these deficiencies, which limit immunological response, may assist remission. Malnutrition is classified as either a macronutrient or a micronutrient deficiency. Protein-energy malnutrition causes micronutrient deficiency, which often affects disease severely [18]. Immune system might be affected by micronutrient deficiencies, predisposing to the initial phase and advancement of UC [19]. Several micronutrients, including selenium, zinc, copper, and iron, influence inflammatory signaling pathways [20]. Selenium is a mineral that is found in many key enzymes and affects growth processes [21].

Zinc promotes intestinal barrier integrity, accelerates DNA synthesis and protein, and backtains several enzyme's catalytic activities [22]. Copper is a protein electron transport and enzyme cofactor that are necessary for oxidative phosphorylation, neurotransmitters, and iron transport [23]. Among UC patients, the most common systemic consequences caused by iron deficiency are cell proliferation and synthesis of impaired lymphocyte cytokine [24]. Regrettably, there is limited research on the micronutrients clinical significance and their regular evaluation in UC patients. The deficiency of zinc serum among UC patients was reported by Jeffery et al [25]. Besides malabsorption and mucosal injury, active disease could be recognized by inadequate nutritional status. Another study by Julie et al [26] reported no significant variance in serum zinc level between UC and control group.

Ugo et al [27] did research on 53 UC patients and found significantly decreased blood selenium levels when compared to healthy controls, which is consistent with our findings. This might be explained by the nausea, poor nutritional intake, stomach pain, and diarrhea. Justyna et al [28] conducted investigations on 60 UC patients and found that UC and healthy subjects had homogenous serum selenium levels. According to Joshaghani et al. [29], low blood magnesium levels in active UC, inactive UC, and healthy control was 80%, 66.7%, and 40% respectively. Mohammadi et al [30] found insignificant association between disease activities and magnesium. Similarly, iron, copper, and zinc serum levels were insignificantly associated with disease severity.

Our investigation found a significant positive association between blood zinc and haemoglobin, owing to the fact that zinc influences haemoglobin via various zinc-dependent enzyme systems involved in erythropoiesis stimulation and haemoglobin production. Zinc concentrations were independently and positively linked with haemoglobin concentrations in about half of the nations studied in a cross-sectional research of 12 countries, indicating that interventions to combat deficiency of zinc may assist to lower incidence of anemia [31]. Additionally, another study reported that the patient's age was significantly associated with serum iron [32]. Similarly, another study found a negative association between patient age and serum iron [33]. Inadequate food intake, elderly patients suffering from chronic inflammation, and hepcidin circulation on higher levels are accounting for systemic iron deficiency and iron metabolism [34].

Conclusion

Micronutrients must be examined in UC patients not only to guide supplementing decisions, but also to raise awareness that correcting these deficiencies, which limit immunological response, may assist remission.

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