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Correlation between endoscopic activity ındices and meteorological parameters in ulcerative colitis

Relationship between ulcerative colitis and meteorological parameters

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Abstract

Aim: The present study aimed to determine the correlation between the Mayo Endoscopic Score (MES), the validated Ulcerative Colitis Endoscopic Severity Index (UCEIS) and seasonal parameters in ulcerative colitis (UC), the prognosis of which is characterized by attacks.

Methods: In the single-center and retrospective study, demographics of the patients who underwent colonoscopy between 2019 and 2023, MES and UCEIS figures, daily and fifteen-day average temperatures (in degrees Celsius), daily average atmospheric pressure (in millibars), daily average humidity (in percentages), and maximum wind speed (in meters per second) were analyzed.

Results: The study was conducted with 103 patients aged 18–92 years whose average age was 48.25 ± 17.09. 59.2% (n = 61) of the participants were male (Female/Male = 42/61) and there was no difference between the participants based on gender (p=0.076). The maximum number of participants (12.9%; n = 13) presented in October, and the minimum presented in July (3.9%; n = 4). It was determined that there was no correlation between MES and UCEIS, and daily and fifteen-day average temperatures, humidity, and pressure. There was no difference between the UCEIS based on the season (p=0.110); however, there was a significant difference between MES (p=0.037) in autumn and summer (p=0.04).

Conclusion: It was determined that MES differed based on the season, the difference was between autumn and summer. However, UCEIS did not differ based on the season.

Keywords

ulcerative colitis, colonoscopy, mes, uceis, meteorological parameters

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Introduction

Ulcerative colitis (UC) is a chronic inflammatory disease characterized by mucosal inflammation attacks in the rectum that extend to the proximal sections of the colon.[1] UC is a multifactorial disease induced by the interaction of genetic, immune, microbial and environmental factors in its progress and pathogenesis, and the disease incidence has increased globally.[2,3] It was suggested that pathogenesis is mostly induced by an inadequate immune response against luminal antigens in the intestine.[4]

It is critical to evaluate the extent and activity of the disease to follow the clinical prognosis of UC to regulate the treatment.[5] Disease activity should be analyzed with a holistic approach based on clinical, laboratory, imaging, and colonoscopy findings.[2]

Various scoring systems have been developed to objectively measure disease activity and mucosal healing. The easy to determine Mayo Endoscopic Score (MES) and the validated Ulcerative Colitis Endoscopic Severity Index (UCEIS) are the most common indices used to determine the vascular pattern, presence of erythema, fragility, erosions, ulcerations, and bleeding.[6,7]

The incidence and prevalence of inflammatory bowel disease (IBD) were determined to be higher in Northern Europe, North America, Northern Australia and New Zealand when compared to Asia[8,9] Furthermore, although the IBD incidence in the Indian subcontinent is low, the fact that Indian individuals who migrated to developed countries in the northern hemisphere exhibited a higher risk demonstrated that geographical location could be effective in the incidence and activation of the disease. Previous studies reported contradictory findings about seasonal changes in IBD activation.[10-11] The correlation between IBD exacerbation and seasonal variation was reported to be either insignificant or high.[12-14]

Thus, we aimed to determine the correlation between MES, UCEIS, and seasonal parameters, which indicate UC disease activity, an inflammatory bowel disease.

Materials and Methods

Demographic and endoscopic data for the adult ulcerative colitis patients who underwent colonoscopy at ...hospital between 01 January 2019 and 31 December 2023 were collected from the digital patient records system. Those younger than 18 were excluded from the study. Endoscopic reports, gender, day, month, year and season of application, daily and fifteen day mean temperature (in degrees Celsius), daily average atmospheric pressure (in millibars), daily average relative humidity (in percentages), and maximum wind speed (in meters per second) during the study period were included in the study data. The weather data were procured from the Environment, Urbanization and Climate Change Ministry, General Directorate of Meteorology internet site.

Ethical Approval

This study was approved by the Ethics Committee of Fırat University (Date: 25.04.2024, Decision No: 2024/06-05).

Statistical Analysis

The study data were analyzed with the SPSS 21.0 (IBM Corporation, Armonk, NY, USA) and Microsoft Excel software. The normal distribution of the data was determined with Kormogrow Smirnov analysis. The data with normal distribution are presented in Mean ± SD and qualitative data are presented in percentages. The independent samples t test was conducted for pairwise group comparison, and Pearson correlation was employed to determine the correlations between the variables. $p<0.05$ was accepted as statistically significant.

Reporting Guidelines

The study was reported in accordance with STROBE guidelines.

Results

The mean age of the 103 18-92 years old patients who underwent colonoscopy due to UC diagnosis in our hospital between 2019 and 2023 was 48.25 ± 17.09. The number of male patients was 61 (59.2%) and female to male ratio was 42/61, and there was no significant difference between the patients based on gender ($p=0.076$).

The maximum number of participants (12.9%; n = 13) presented in October, and the minimum number of patients presented in July (3.9%; n = 4) (Table 1, Figure 1).

In the study, it was determined that there were no correlations between MES and UCEIS scores and daily average temperature, humidity, pressure and the 15-day average temperature, humidity, and pressure data (Table 2).

The comparison of the seasonal patient activation scores revealed that the mean MAYO score differed between all seasons ($p=0.037$) and the difference was significant between autumn and summer ($p=0.04$) (Table 3). However, the mean UCEIS score did not differ based on the season ($p=0.110$).

Discussion

In the study, it was determined that there was no difference between the colonoscopy activation scores of the patients based on the month of the year. The comparison of the activation scores based on the season revealed that the mean MES score differed between the seasons and the difference between autumn and summer was significant ($p=0.04$). It was determined that the mean UCEIS score did not differ based on the season.

A systematic review and meta-analysis conducted by Moon SJ et al. reviewed 20 studies on the effects of weather, seasons, and atmosphere on IBD exacerbation, and a meta-analysis was conducted on the correlation between seasonal variations and IBD exacerbation on seven studies. The findings revealed a weak correlation. In the UC subgroup (six studies), seasonal variation also exhibited a weak correlation. Furthermore, studies on temperate climates (five studies) demonstrated a non-negligible, weak but significant positive correlation.[15] Similarly, in the present study, the comparison of the activation scores and seasons demonstrated that the mean MES scores differed between autumn and summer, while there were no differences between the other seasons.

In a survey conducted with more than 1000 IBD outpatients, half of the IBD patients stated that the exacerbation of the disease was seasonal and occurred mostly in winter.[16] However, although the intestinal microbiota in healthy individuals is generally stable throughout the year, the composition of the fecal microbiota could vary based on race and country of residence.[17] Since the present study was regional and conducted with a small sample size, the findings were not consistent with the previous studies. Thus, further studies should be conducted with more participants, further sociodemographic data and analyses.

Country of residence and the time period are important factors in ulcerative colitis. There are differences in the incidence of ulcerative colitis within Europe, with higher incidences in countries in the western and northern regions than in eastern countries.[18] Due to the multitude of measurable and unknown variables associated with latitudinal differences, it is difficult to evidence specific factors. However, numerous hypotheses are known to explain differences between incidences based on latitudinal gradient, including differences between geographic environments, socioeconomic factors, temperature variations, and sunlight exposure. Despite the obvious differences between the incidence rates and latitudes, few studies focused on the factors

that could explain the differences. Some suggested that sun or ultraviolet exposure and vitamin D levels could be potential factors. However, these hypotheses were not thoroughly tested.[19] A study reported that the vitamin D levels in a healthy control group were significantly associated with the season ($p<0.05$), while the same finding was not observed in IBD patients.[14] All these findings could suggest that there was no correlation between colonoscopy scores that indicated disease activation and daily, 15-day average, and monthly meteorological data; however, the present study findings did not demonstrate a significant correlation. The only seasonal correlation was determined for the mean MES score. Thus, future studies should be conducted based on several factors, and it could be suggested that meteorological data could help understand the correlation between the disease and weather.

Limitations

The main limitation of our study was the fact that it was conducted in a single center, and it was retrospective. Furthermore, since the endoscopies are generally conducted during daytime and on weekdays, this could have further reduced the possibility of UC activation due to daily meteorological parameters. Thus, the 15-day data were employed to reduce the above-mentioned impact

Table 1. *Monthly Ulcerative Colitis Patient Application and Mean Meteorological Data*

				Daily			15 day average		
Month	N(%)	Uceis	Mes	Temperature	Humidity	Pressure	Tempera-ture	Humidity	Pressure
January	9 (8.7)	4.33 ± 1.7	1.67 ± 0.70	3.54 ± 1.88	72.4 ± 11.12	907.05 ± 3.59	2.66 ± 2.63	120.68 ± 139.03	907 ± 4.01
February	9 (8.7)	4.55 ± 1.87	1.77 ± 0.83	4.244 ± 4.6	68.22 ± 16	906.1 ± 2.79	3.77 ± 2.53	73.45 ± 6.13	906.13 ± 1.09
March	10 (9.7)	4.8 ± 1.32	2 ± 0.67	10.74 ± 5.46	56.14 ± 12.53	903.88 ± 4.03	8.29 ± 3.71	60.84 ± 9.89	905.52 ± 2.55
April	9 (8.7)	4.22 ± 1.92	1.55 ± 0.88	17.42 ± 7.06	59.12 ± 17.1	901.92 ± 5.38	13.61 ± 5.45	60.55 ± 14.79	902.63 ± 2.51
May	10 (9.7)	4.8 ± 1.69	1.7 ± 0.95	18.94 ± 4.3	58.02 ± 17.51	901.67 ± 2.81	17.96 ± 5.33	53.09 ± 11.37	902.78 ± 1.42
June	7 (6.8)	5 ± 1.91	2.28 ± 0.95	26.47 ± 2.28	37.67 ± 11.99	899.17 ± 2.59	25.13 ± 4.31	39.57 ± 12.61	900.91 ± 1.46
July	4 (3.9)	5.25 ± 2.06	2.25 ± 0.96	33.1 ± 5.38	23.9 ± 4.39	899.03 ± 1.94	30.76 ± 3.52	28.19 ± 5.47	898.02 ± 2.12
August	6 (5.8)	5.33 ± 1.63	2 ± 0.63	33.55 ± 7.46	18.65 ± 4.4	899.4 ± 3.11	32.88 ± 6.31	24.89 ± 6.11	898.17 ± 1.96
September	8 (7.8)	3.37 ± 1.3	1.25 ± 0.46	25.27 ± 6.75	29.46 ± 11.63	901.29 ± 2.77	26.11 ± 4.93	28.71 ± 4.13	901.88 ± 0.78
October	13 (12.6)	4.46 ± 1.98	1.69 ± 0.95	19.81 ± 5.22	46.08 ± 13.79	906.74 ± 3.29	22.17 ± 4.3	42.58 ± 12.16	905.57 ± 2.14
November	10 (9.7)	3.8 ± 1.23	1.4 ± 0.7	12.73 ± 4.58	62.55 ± 15.21	909.5 ± 1.33	13.98 ± 4.57	59.13 ± 5.97	907.4 ± 0.84
December	8 (7.8)	4.87 ± 1.96	2 ± 0.93	8.47 ± 3.54	77.25 ± 13	909.54 ± 6.27	9.8 ± 2.5	77.73 ± 4.21	908.19 ± 0.9
P	.205	.554	.414	.002	.420	.325	.000	.398	.429
Total	103(100)	4.50 ± 1.71	1.76 ± 0.82	16.48 ± 10.18	53.29 ± 21.23	904.34 ± 4.94	16.06 ± 9.98	57.93 ± 47.05	904.27 ± 3.56

Table 2. *MES and UCEIS scores and Daily and 15-day average meteorological data*

Score		Daily meteorological data			15-day average meteorological data		
		Temperature	Humidity	Pressure	Temperature	Humidity	Pressure
MES	r	0.055	0.026	-0.012	0.114	0.028	0.021
	p	0.580	0.797	0.904	0.252	0.781	0.829
UCEIS	r	0.051	0.035	0.010	0.121	-0.024	0.035
	p	0.609	0.727	0.920	0.224	0.808	0.724

Table 3. *The Ulcerative Colitis Patient Seasonal Application and Mean Meteorological Data*

				Daily Meterorological Data			15-Day Average Meteorological Dat		
Season	N (%)	Uceis	MES	Temperature	Humidity	Pressure	Temperature	Humidity	Pressure
Winder	26 (25.2)	4.57 ± 1.79	1.81 ± 0.80	5.30 ± 4.01	72.44 ± 13.51	907.48 ± 4.44	5.24 ± 3.97	91.11 ± 81.77	907.06 ± 2.54
Spring	229 (28.2)	4.62 ± 1.61	1.76 ± 0.83	15.64 ± 6.57	57.71 ± 15.27	902.51 ± 4.12	13.27 ± 6.22	58.07 ± 12.21	903.67 ± 2.52
Summer	17 (16.5)	5.18 ± 1.74	2.18 ± 0.8*	30.51 ± 6.08	27.71 ± 11.89	899.21 ± 2.50	29.19 ± 5.88	31.71 ± 11.15	899.26 ± 2.2
Autumn	31 (30.1)	3.97 ± 1.62	1.48 ± 0.76	18.93 ± 7.19	47.10 ± 18.44	906.22 ± 4.1	20.54 ± 6.56	44.33 ± 14.6	905.20 ± 2.6
P	0.294	0.110	0.034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total	103 (100)	4.50 ± 1.7	1.76 ± 0.82	16.48 ± 10.17	53.29 ± 21.22	904.34 ± 4.93	16.06 ± 9.97	57.93 ± 47.09	904.26 ± 3.55

** In the comparison of summer and autumn MES p=0.04*

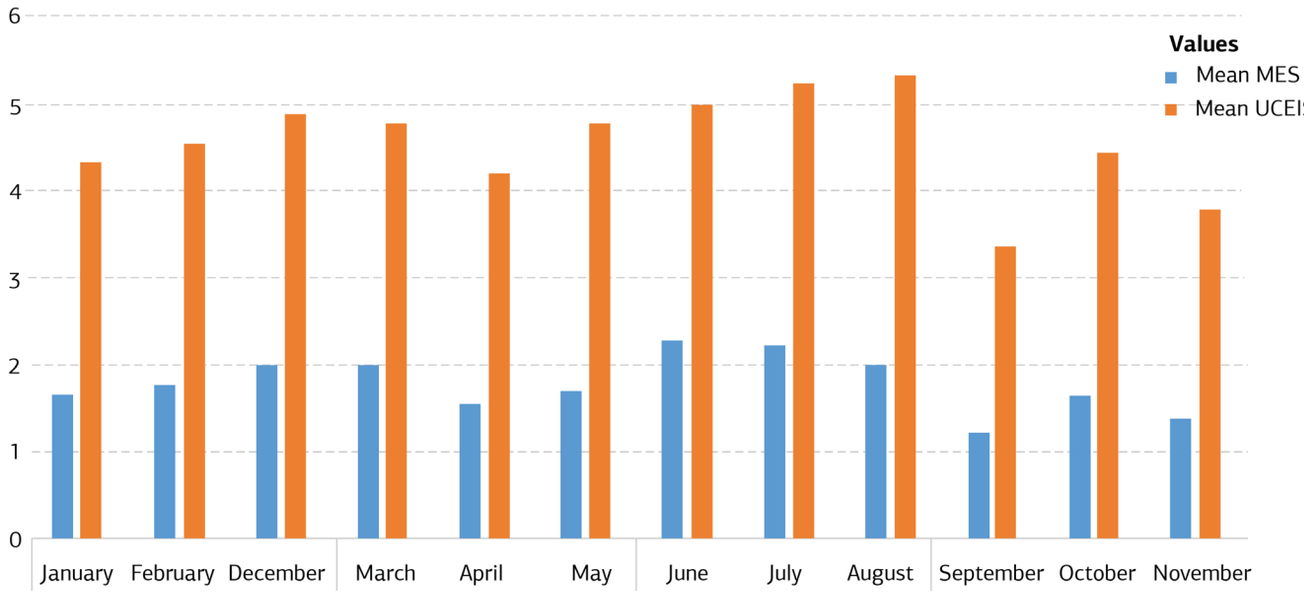

Figure 1. *Seasonal Mean Activation Scores of the Patients*

in the current study. These limitations of the present study would assist future studies on similar topics.

Conclusion

In conclusion, although the present study was not a preliminary study that demonstrated a significant correlation between UC and seasons, the scoring system revealed that there could be a correlation. However, it could be suggested that this hypothesis would lead to better clinical, laboratory and imaging findings in future more comprehensive and multi-center studies on latitudinal and meteorological factors, namely the unknown aspects of the disease.

Declarations

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent

Informed consent was waived due to the retrospective design of the study.

Data Availability

The data are not publicly available due to privacy restrictions but are available from the corresponding author upon reasonable request.

Conflict of Interest

The authors declare that there is no conflict of interest.

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None.

Abbreviations

IBD: Inflammatory bowel disease
MES: Mayo endoscopic score
UC: Ulcerative colitis
UCEIS: Ulcerative colitis endoscopic severity index

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