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Relationship between Gastrointestinal System Bleeding and Meteorological Conditions: Antalya Province

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Abstract: Background : Environmental factors occupy a significant position in the etiological structure of diseases. One such factor is meteorological parameters. Alterations in hormonal conditions and environmental factors in response to meteorological effects have the potential to result in adverse outcomes, including mortality and morbidity. **Aims:** The objective of this study was to examine the correlation between gastrointestinal system bleeding and meteorological variables, which represent environmental influences. **Methods:** The study included cases of lower and upper gastrointestinal bleeding in individuals aged 18 and above who had applied to a tertiary education and research hospital between January 1, 2023, and December 31, 2023. The relationship between the meteorological data of the Antalya-Muratpaşa district, where the study was conducted, and the application periods of the patients was compared. **Results:** A total of 250 cases were admitted to the hospital in 2023, yielding a prevalence of 0.06%. No significant difference was observed in temperature, humidity, wind speed, pressure, and weather conditions between the 185 days during which cases were admitted and the days during which no cases were seen. The month in which cases were most frequently seen was January, and a significant difference was noted in the distribution of cases by month (p=0.011). No significant difference was observed by season. **Conclusion:** It can be reasonably concluded that there is no discernible correlation between GIB and meteorological variables such as dew point, humidity, wind speed, and pressure.

Keywords: Sesonality, gastrointestinal hemorrhage, Prevalance.

INTRODUCTION

Gastrointestinal bleeding (GIB) is a significant medical condition characterised by blood loss from the gastrointestinal tract, which may present as hematemesis, melena, or hematochezia [Kate, V, *et al*., 2022]. It is categorised as upper gastrointestinal bleeding (UGIB) and lower gastrointestinal bleeding (LGIB), with UGIB being the more common and usually more severe. Prompt diagnosis and treatment are essential for this condition, as it has the potential to be life-threatening, particularly in cases of massive bleeding [Piplani, S, *et al*., 2024; Tokar, J. L, *et al*., 2022]. Upper gastrointestinal bleeding (UGIB) occurs above the Treitz ligament and is typically attributable to peptic ulcer disease, variceal bleeding, and lesions of the oesophagus or stomach. It is responsible for approximately 70% of IOP cases [Sengupta, N, *et al*., 2023]. LGIB occurs below the ligament of Treitz, with diverticular disease representing the most common aetiological factor. It is less prevalent than LGIB and is generally associated with a lower mortality rate [Bedel, C, *et al*., 2020; Mosli, M, *et al*., 2020]. An accurate diagnosis necessitates the integration of multiple data sources, including clinical evaluation, laboratory tests, radiological imaging, and endoscopic procedures. Endoscopy represents a fundamental instrument for both diagnostic and therapeutic purposes [Talemal, L, *et al*., 2023].

A growing body of evidence indicates that there is a correlation between gastrointestinal bleeding and environmental factors. Some researchers have concentrated their attention on the rise in temperature in cases where complications have occurred, while others have focused on the increase in incidence resulting from the rise in influenza infections during the winter months. Furthermore, some researchers have investigated the increase in incidence during the winter months, hypothesizing that periodic changes in gastric juice volume due to accelerated Helicobacter pylori infection may contribute to this phenomenon. However, there is a paucity of literature examining the relationship between GIB and seasonal and climatic conditions. Consequently, this study aimed to examine the relationship between GIB and seasonal and climatic conditions.

MATERİALS AND METHODS

This study was performed retrospectively on gastrointestinal hemorrhage cases admitted to the emergency department of a tertiary care teaching and research hospital. The patients were diagnosed by physical examination, clinical examination and gastroneterology department of the hospitalization service and the diagnosis of bleeding was clear. Bleeding codes were clarified by scanning the ICD-10 code and bleeding codes from the cases registered in the hospital data processing system. After ethical approval, all patients over the age of 18 years with a diagnosis of upper and lower GI bleeding who presented to the emergency department between 01.01.2023 and 31.12.2023

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were included in the study. The study was conducted using the hospital information management system and the days of admission and the number of patients admitted on those days were determined. The relationship between these data and weather conditions was analyzed.

Meteorological Data

Weather information for the Antalya Muratpaşa (07030) region, where the hospital serves, was obtained from the "General Directorate of Meteorology" database using API. The twelve months of the year were divided into four seasonal periods: winter (December through February), spring (March through May), summer (June through August), and autumn (September through November). Additionally, seasonal differences were evaluated. Air temperature, relative humidity, Dew Point, pressure, wind speed and weather conditions were recorded and a daily database was created. The mean was calculated for each month, and the monthly differences were evaluated.

STATİSTİCAL ANALYSİS

Patient data and metrological data determined in the study were analyzed using SPSS version 27 (IBM Co. USA) and Graphpad Prism 9 program was used for graphics. After defining the data, categorical data were expressed as percentage and frequency. The correlation between categorical data was analyzed. Distribution analysis of numerical data was performed. Data conforming to normal distribution were defined as mean ± standard deviation. The t-test was used between numerical data that fit the normal distribution. Data with a p value below 0.05 were considered significant.

RESULTS

In our study, a total of 250 case presentations were observed, with a prevalence of 0.06%. The number of days with cases was 185 days. There was no significant difference in temperature, dew point, humidity, wind speed and pressure between the days with and without cases. Table 1 shows the relationship between seasonal characteristics and days with cases.

Table 1: Seasonal characteristics of days with and without cases

	Free (n=180)	Case day (n=185)	p-value
Temperature	22,13±7,94	22,2±7,99	0,795
Dew Point	11,33±7,14	10,89±7,78	0,195
Humidity (%)	54,86±20,85	53,63±21,96	0,736
Wind speed	13,85±8,33	13,15±7,57	0,508
Pressure	1007,02±6,22	1007,53±5,72	0,261

While 50.8% of GI bleedings were seen on clear days, no significant difference was seen in the comparison between case distributions and weather conditions (p=0.410). Table 2 shows the relationship between weather conditions and the incidence of cases.

Table 2: Days with cases by weather condition

	Free (n=180)	**Case day (n=185)**	**p-value**
Fair	89 (%49,4)	94 (%50,8)	0,410
Windy	8 (%4,4)	6 (%3,2)	
Rainy	9 (%5)	13 (%7)	
Cloudy	74 (%41,1)	72 (%38,9)	

In the analysis of the incidence of cases according to months, the most common month was January. There was a significant difference in the incidence of cases according to months (p=0.011). The distribution of cases according to months is shown in Figure 1. There was no significant difference in the frequency of cases according to the seasons (p=0,269). Case distribution according to seasons is shown in Figure 2.

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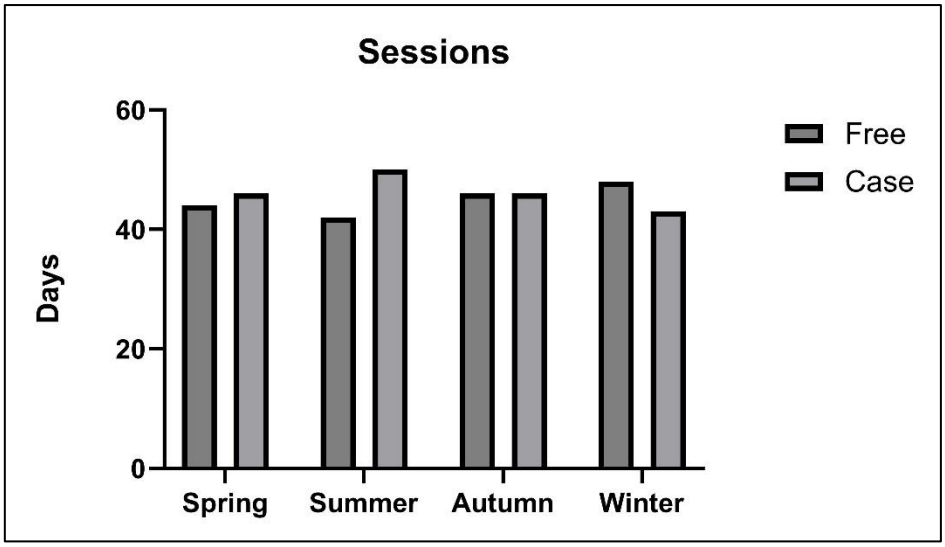

Figure 1: Days with cases by season

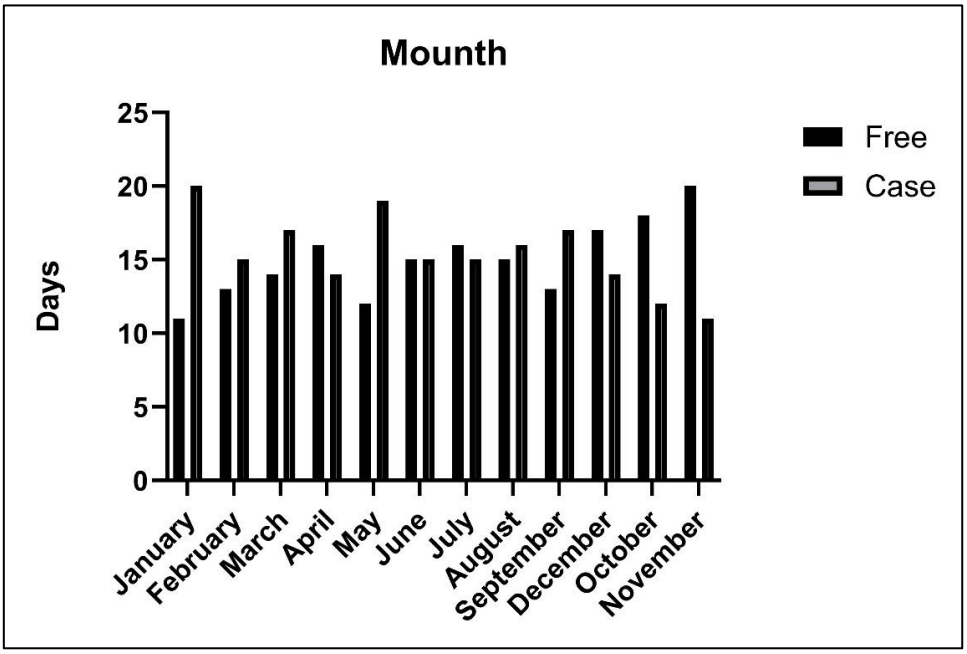

Figure 2: Days with cases by month

DİSCUSSİON

GIB represents a significant medical condition, characterised by the presence of bleeding within the gastrointestinal tract. If not promptly managed, it has the potential to be life-threatening. It is classified into upper and lower GIB, with upper GI bleeding being more prevalent and associated with elevated morbidity and mortality rates [Oakland, K, *et al*., 2019]. The management of GIB requires a prompt assessment, stabilisation and identification of the source of bleeding, followed by the implementation of appropriate therapeutic interventions. The condition is a common medical emergency with significant mortality rates, which have remained at approximately 10% for the past two decades [Guo, C. G, *et al*., 2021]. The relationship between gastrointestinal bleeding (GIB) and meteorological conditions is a complex interaction, influenced by a range of meteorological factors and seasonal patterns. The available evidence indicates that the prevalence of GIB, encompassing both upper and lower gastrointestinal bleeding, is subject to fluctuations in response to alterations in temperature, atmospheric pressure, and other meteorological variables [Guo, C. G, *et al*., 2020]. In our study, although we observed an increase in cases in January, we did not find a significant relationship between climatic conditions and GIB patients.

The relationship between gastrointestinal bleeding (GIB) and meteorological conditions is a complex phenomenon, influenced by a range of

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meteorological factors and seasonal patterns. A review of the literature reveals a consistent pattern whereby GIB is more prevalent during the winter months. For example, Lenzen et al. observed that cases of GIB are more frequent during the winter months, with a significant increase during nighttime hours [Lenzen, H, *et al*., 2017]. Similarly, Guo et al. reported that cases of UGIB are higher in winter, especially among older adults [Uzunay, H, *et al*., 2021]. In contrast, some studies, such as the study conducted in Northern India, have observed a peak in variceal haemorrhage during the summer months, suggesting regional differences in seasonal patterns [Shiekh, S. A, *et al*., 2021]. The temperature is a key meteorological factor. A reduction in temperature is associated with an increase in cases of GIB. For example, Chen, et al., (2013) observed that oesophagogastric variceal bleeding is more prevalent in colder temperatures, potentially due to vasoconstriction and increased portal venous flow [Chen, J, *et al*., 2013]. Similarly, Nomura et al. reported an inverse relationship between temperature and gastric ulcer bleeding. Several studies emphasise the role of atmospheric pressure in GIB. Vucelić et al. demonstrated that lower atmospheric pressure was associated with an increased incidence of bleeding from peptic ulcers [Vucelić, B, *et al*., 1993]. This is corroborated by the findings of other studies that have established a correlation between atmospheric pressure fluctuations and incidents of GIB [Utrata, J, 1958]. The impact of meteorological conditions on the incidence of unprotected gunshot wound-related intracranial haemorrhage (UGIB) may vary depending on the geographical region and the underlying aetiology of the bleeding. To illustrate, in Beijing, different aetiologies of UGIB exhibited disparate meteorological patterns, and peptic ulcer disease and esophagogastric varices demonstrated divergent responses to climate change [Yuan, Y, *et al*., 2020]. Furthermore, the use of non-steroidal anti-inflammatory drugs (NSAIDs), a common risk factor for UGIB, demonstrates seasonal fluctuations that may be consistent with weather patterns, thereby further complicating the relationship between UGIB and weather [Sezgin, O, *et al*., 2007]. A review of the literature reveals a higher incidence of upper gastrointestinal bleeding (UGIB) during the winter months. This pattern is particularly evident in older populations, with those aged 60 and above exhibiting pronounced seasonal fluctuations in UGIB incidence [Guo, C. G, *et al*., 2021; Lenzen, H , *et al*., 2017]. The incidence of gastric ulcer-related bleeding has been found to decrease in summer and increase in autumn and winter, with an inverse relationship to temperature and vapor pressure [Nomura, T, *et al*., 2001]. A correlation has been identified between lower temperatures and higher atmospheric pressure and an increased incidence of UGIB. This suggests that colder weather may exacerbate conditions leading to bleeding [Guo, C. G, *et al*., 2021; Lenzen, H , *et al*., 2017]. The influence of atmospheric pressure and humidity on the occurrence of peptic ulcer haemorrhage is a significant factor. A reduction in atmospheric pressure has been linked to an increased incidence of bleeding episodes, particularly in the days preceding and during the occurrence of bleeding events [Vucelić, B, *et al*., 1993]. Furthermore, relative humidity has been identified as a relevant factor, particularly in the days prior to bleeding for duodenal ulcers [Vucelić, B, *et al*., 1993]. The threat to gastrointestinal health posed by climate change, which is characterised by increased temperatures and extreme weather events, is broader in scope. Such changes may result in alterations to disease patterns, including an increased prevalence of gastrointestinal infections and modifications to the gut microbiota [Sadeghi, A, *et al*., 2023]. The healthcare sector, including gastroenterology, is also affected by climate change, and there is a need for sustainable practices to mitigate its effects [Duijvestein, M, *et al*., 2024]. In our study, we found no significant difference between Dew point, Humidity, wind speed and pressure. We also found no significant difference between months and seasons. We only found an increase in cases in January.

Our study had some limitations. The first of these is that since it was a retrospective study of the cases, we could not clearly determine the instantaneous climate changes between the date of the cases. Climate conditions may change instantaneously and according to the conditions of the day, which is also a limitation that we accept. Prospective studies with a large number of patients are needed to understand the value of our study.

CONCLUSİON

It can be reasonably concluded that there is no discernible correlation between GIB and meteorological variables such as dew point, humidity, wind speed, and pressure.

ETHİCAL APPROVAL

Approval for the ethical conduct of the research project was obtained from the relevant ethics

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committee. Following the acquisition of ethical approval from the relevant committee, the conditions set forth in the Declaration of Helsinki were duly observed. The authors of this study have no conflicts of interest among themselves or with any other subject.

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