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Effects of Seasonal Variation on Upper Gastrointestinal System Bleeding in Emergency Department

Mevsimsel Değişikliklerin Acil Serviste Üst Gastrointestinal Sistem Kanaması Üzerine Etkisi

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Abstract

Objective: Multiple factors are known to be associated with a high risk of morbidity and mortality in Upper Gastrointestinal Bleeding (UGB). In addition to these risk factors, it has been suggested that seasonal variations can influence UGB. In this study, it is investigated whether there is a relation between seasonal variation and the incidence of UGB, Glasgow-Blatchford risk score and clinical and laboratory parameters.

Material-Method: We retrospectively reviewed the records of the patients who were diagnosed and hospitalized with UGB. Age, gender, admission date, laboratory parameters, vital signs and Glasgow-Blatchford risk score at admission, intensive care unit admission, length of stay, erythrocyte suspension transfusion requirement and outcome were all documented. Patients who were referred to another hospital despite having diagnosed UGB, patients who were found to have been misdiagnosed while follow-up and patients under 18 years old were excluded. The 12 months of the year were divided into four seasons as winter, spring, summer and autumn.

Results: We included 271 patients, of whom 163 were males and 108 were females. While 205 patients were followed in intensive care unit, 66 were followed in the ward. Erythrocyte suspension transfusion had been applied to 187 patients and 35 patients had died. High blood urea nitrogen, Glasgow-Blatchford risk score and heart rate, and low systolic and diastolic blood pressure was found statistically associated with mortality. The number of patients with UGB increases in spring with a raise especially in May and bottoms out in autumn. There was no statistically significant difference at clinical and laboratory findings between seasons.

Conclusions: We observed that UGB incidence increases in spring and emergency physicians need to be more prepared in that season. However, none of the clinical or laboratory variables has been found statistically associated with seasonal factors.

Keywords: Emergency Medicine, Seasonal Variation, Upper Gastrointestinal Bleeding.

Özet

Amaç: Birçok klinik değişken üst gastrointestinal sistem (GİS) kanamasında yüksek morbidite ve mortalite ile ilişkilendirilmiştir. Bu risk faktörlerine ek olarak, mevsimsel değişikliklerin üst GİS kanamasını etkileyebileceği öne sürülmektedir. Bu çalışma ile mevsimsel değişiklikler ile üst GİS kanamasının insidansı, Glasgow-Blactford risk skoru ve bazı klinik ve laboratuar değişkenler arasındaki ilişki araştırılmıştır.

Materyal-Metot: Üst GİS kanama tanısıyla hastaneye yatırılan hastaların dosyaları tarandı. Yaş, cinsiyet, başvuru tarihi, başvurudaki laboratuar sonuçları, vital bulguları, Glasgow-Blacford skoru, yoğun bakım ihtiyacı, yatış süresi, eritrosit süspansiyonu ihtiyacı ve hasta sonlanımı kayıt edildi. Başka merkeze sevk edilen hastalar, yatışı süresinde üst GİS kanama tanısı dışlanan hastalar ve 18 yaş altı hastalar çalışma dışı bırakıldı. Bir yıllık süre kış, ilkbahar, yaz ve sonbahar olmak üzere 4 mevsime ayrıldı.

Bulgular: Çalışmamıza 163 erkek, 108 kadın olmak üzere toplam 271 hasta dahil edildi. Yoğun bakıma yatan hasta sayısı 205, servise alınan hasta sayısı 66 idi. 187 hastaya eritrosit süspansiyonu uygulandığı, 35 hastanın ise öldüğü tespit edildi. Kan üre azotu, Glasgow-Blacford skoru, kalp hızı yüksekliği ile düşük sistolik ve diastolik kan basıncı değerleri yüksek mortalite ile ilişkili saptandı. Üst GİS kanamalı hasta sayısının özellikle mayıs ayında olmak üzere ilkbaharda arttığı, sonbaharda azaldığı saptandı. Mevsimler arasında klinik ve laboratuar bulgular açısından istatistiksel olarak anlamlı bir farklılık saptanmadı.

Sonuç: Üst GİS kanamalı hasta sayısının ilkbahar aylarında arttığı görülmektedir. Acil servis hekimleri bu aylarda üst GİS kanama açısından daha dikkatli olmalıdırlar. Ayrıca mevsimler arasında hiçbir klinik ve laboratuar bulgusu açısından anlamlı farklılık olmadığı görülmektedir.

Anahtar kelimeler: Acil Servis, Mevsimsel Değişiklikler, Üst GİS Kanama.

Introduction

Upper Gastrointestinal System Bleeding (UGB) originates at sites proximal to Treitz ligament and mostly occur due to gastric or duodenal ulcers. UGB presents with symptoms like hematemesis, hypotension, blood in stool, and darkening of stool color and is an important cause of mortality and morbidity. Despite all advances in diagnosis and management, 5-10% of patients presenting to emergency departments with UGB are currently lost (1, 2).

In UGB patients, early risk stratification allows appropriate

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therapy that may be helpful for reducing morbidity and mortality. Multiple clinical factors, including old age, unstable vital signs, melena, and various comorbid illnesses, together with laboratory markers such as low hemoglobin (Hg) and elevated blood urea nitrogen (BUN) levels, are known to be associated with a high risk of morbidity and mortality (3). In addition to these risk factors, it has been suggested that seasonal variations can influence UGB. Some studies have shown a seasonal fluctuation in the incidence of UGB, but this seasonal pattern remains controversial (4, 5). In fact, while some studies have revealed an increased incidence in winter and a decreased incidence in summer, others have shown no seasonal influence (4-6).

In this study, it is investigated whether there is a relation between seasonal variation and the incidence of UGB, Glasgow-Blatchford risk scoring system and some clinical laboratory parameters.

Material and Methods

This study is conducted in an emergency department of a Süleyman Demirel University Faculty of Medicine hospital with an average admission of 50,000 patients per year. Approval was obtained by Süleyman Demirel University Faculty of Medicine Clinical Research Ethics Committee (04/07/2018-130). We retrospectively reviewed the records of the patients who was diagnosed with UGB and hospitalized following their admission from May 1, 2016 to May 1, 2018. Age, gender, admission date, vital signs, BUN, Hg, BUN/creatinine ratio (BCR) and GBS at admission, Intensive Care Unit (ICU) admission, length of stay, erythrocyte suspension transfusion (EST) requirement and mortality rate were all documented. Patients who were referred to another hospital despite having diagnosed UGB, patients who were found to have been misdiagnosed while follow-up and patients under 18 years old were excluded. The 12 months of the year were divided into four seasons as winter (December, January, February), spring (March, April, May), summer (June, July, August) and autumn (September, October, November). Seasonal differences were evaluated.

The data were analyzed using SPSS software (version 20.0; SPSS, Chicago, IL, USA). Descriptive statistics for categorical variables are shown as percentages; the $\chi 2$ test was used to compare groups. The fit of continuous variables to a normal distribution was investigated using the Kolmogorov-Smirnov test; descriptive statistics are presented as mean ±standard deviation. Independent Samples t-test was used to compare normally distributed independent variables and Mann-Whitney U test was used to compare the non-normally distributed independent variables.

Results

We included 271 patients, of whom 163 (60%) were males and 108 (39.9%) were females, in the study. The mean age was determined as 66.9 (±16.1) years in male patients and as 71.4 (±17.9) years in female patients. While 205 (75.6%) patients were monitored in ICU, 66 (24.4%) patients were monitored in the ward. It was determined that EST had been applied to 187 (69%) patients. It was seen that 35 (12.9%) patients had died as a consequence of UGB. A detailed comparison of the laboratory and clinical variables according to outcome of UGB is given in Table 1.

Table 1. Comparison of the clinical and laboratory variables of the patients according to outcome

	EXITUS (n:35)	DISCHARGED (n:236)	TOTAL (n:133)	P value
Age (years)	74.7±10.8	68.3±17.3	69.1±16.7	0.078
E/K	19/16	144/92	163/108	0.448
Hg (g/dl)	8.9±3.0	9.7±2.7	9.5±2.8	0.119
BUN (mg/dl)	50.4±31.3	35.7±24.4	37.6±25.8	**0.001**
BCR	29.9±13.8	29.6±16.1	29.7±15.8	0.610
SBP (mmHg)	108.4±26.1	121.6±26.9	119.9±27.1	**0.008**
DBP (mmHg)	61.2±17.1	69.6±16.8	68.6±17.0	**0.014**
Pulse (beats/min)	103.8±24.9	91.2±19.8	92.8±20.9	**0.004**
GBS	11.7±3.8	8.6±4.1	9.0±4.2	**<0.001**

M/F: Male/Female, Hg: Hemoglobin, BUN: Blood Urea Nitrogen, BCR: BUN/Creatinine Ratio, SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, GBS: Glasgow-Blatchford Score.

It was determined that the number of hospitalized patients due to UGB was highest in May (n:34) and lowest in October (n:17). Additionally, it was seen that the number of the patients was highest in spring and lowest in autumn (Graphic 1). A detailed comparison of the laboratory and clinical variables according to seasons is given in Table 2.

Discussion

Many studies have been conducted on incidence, predisposing factors, treatment management, and prognosis of UGB and on factors influencing its mortality. However, the number of the studies investigating the influence of the seasonal variation on UGB is few. In some studies, it has been claimed that especially cold climate conditions increase UGB for various reasons (5, 7). Nonetheless, in most of these studies the authors concentrated rather on the influence of climate conditions on the number of cases and endoscopic findings. The aim of this study is to investigate the influence of seasonal factors on clinical parameters of UGB, besides investigating whether the frequency of UGB cases admitted to emergency departments seasonally differs or not.

The mortality rate in our study is calculated as 12.9%. This percentage is higher than the percentages reported in the literature. Mortality rates are shown to be 5-10% in the literature (1, 2). More serious cases, had been admitted to peripheral hospitals, were referred to our hospital because our hospital is a level 3 university hospital. We believe that this is the reason why the mortality rate in our study is determined to be higher than those in the literature. Moreover, as an evidence for our interpretation, high rates of admission to ICU and EST stand out in our study.

In the evaluation of the clinical and laboratory variables

Table 2. Assessment of patient data according to seasons

	WINTER	SPRING	SUMMER	AUTUMN	P value
Age (years)	67.5±17.2	68.8±18.5	73.6±14.0	66.4±15.5	0.064
M/F	37/29	48/32	36/28	42/19	0.424
Hg (g/dl)	9.8±2.5	9.4±2.8	9.3±2.8	9.7±2.9	0.650
BUN (mg/dl)	37.0±25.9	36.9±23.4	42.4±32.0	**34.2±20.8**	**0.674**
BCR	29.3±18.1	31.1±16.7	31.8±15.3	25.9±11.7	0.128
SBP (mmHg)	120.9±28.4	121.2±28.0	118.1±26.0	**118.8±26.1**	**0.915**
DBP (mmHg)	69.8±17.2	70.6±17.9	66.1±15.9	**67.2±17.2**	**0.462**
Pulse (beats/min)	93.6±21.0	91.7±20.2	89.5±20.1	**96.9±22.1**	**0.146**
GBS	8.7±4.4	9.2±4.1	9.4±4.1	**8.7±4.3**	**0.810**
LOS (days)	10.9±9.6	9.6±8.2	8.1±6.5	**8.0±5.2**	**0.548**
Mortality Rate (%)	13.6	12.5	15.6	**9.8**	**0.807**
EST Rate (%)	31.8	32.5	29.6	**29.5**	**0.974**

M/F: Male / Female, Hg: Hemoglobin, BUN: Blood Urea Nitrogen, BCR: BUN / Creatinine Ratio, SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, GBS: Glasgow-Blatchford Score, LOS: Length of Stay, EST: Erythrocyte Suspension Transfusion

monitored at the time of admission to the emergency department, high BUN, GBS and heart rate, and low systolic and diastolic blood pressure was found to be statistically significant in patients with mortality. Given that GBS criteria involves BUN, heart rate and systolic blood pressure, it has been suggested by our study that high GBS can be used as a mortality predictor in UGB patients in emergency departments although it was not developed for mortality prediction. There are also some reports supporting this view in the literature (8). However, contrary to the literature, significant differences with respect to age, gender, and hemoglobin values in cases with mortality cannot be found in our study (3). From this point of view, our study shows that deciding the clinical severity of the patient in emergency department assessment on the basis of only these parameters can give rise to mistakes in patient management.

It has been determined in our study that the number of patients with UGB increases significantly in spring with an explicit raise especially in May and that it, on the other hand, bottoms out in autumn. In a study also conducted in our country by Sezgin et al., similar results supporting our findings have been found (6). In contrast to these findings found in our study, it has recently been suggested that cold climate conditions increase the incidence of bleeding especially due to peptic ulcer. Yuan et al., in their study, observed a decrease in barrier functions of gastric mucosa and an increase at mucosa damage in cold climate conditions, and they claimed that this increased the incidence of peptic ulcer bleeding (9). In many other studies, it has been claimed that the frequency of UGB increases because of the increase in the incidence of helicobacter pylori and NSAID usage in winter (5, 7). On the other hand, albeit there was no investigation of etiology of UGB in our study, we think that the reason behind the incidence increase especially in spring, which is supported by other studies conducted in our country, can be related to the geographical properties of our country and dietary habits of our society.

The main purpose of our study was to determine the influence of climatic variations on clinical and laboratory findings in UGB. Although the patients were found to be older and have higher BUN, BCR, GBS and mortality rate in summer when the temperature is high, there was not any statistically significant difference among these findings (Table 2). Nonetheless, when we consider summer and spring as warm seasons, autumn and winter as cold seasons, we observed that the patients who admitted in warm seasons have significantly higher BCR values (Table 3). We think that this observation can be related with the fact that insensible fluid loss is higher in warm climate conditions. But despite having higher BCR values, there was not any difference at mortality rate or EST requirement between warm and cold season groups. Although the BCR is mainly used to differentiate the UGB from lower gastrointestinal bleeding, there is limited data in the literature claimed that high levels of BCR could be an indicator of worse clinical outcome in UGB (10). Urashima et al. found a correlation between BCR values and the need for transfusion of blood products in a study conducted on pediatric patients (11). This result found in our study makes us think that warm climate conditions can cause high BCR values in UGB patients, albeit it doesn't affect other clinical parameters.

The most important constraint in our study is the fact that it is a retrospective study. Furthermore, that we could not make an exclusion about the patient's additional diseases and medications they used, and that we could not distinctly evaluate the patients who were admitted by themselves or referred from other centers are important constraints of the study.

Table 3. Comparison of the clinical and laboratory variables of the patients according to climate conditions

	Cold Climate	Warm Climate	P value
BCR	27.7±15.4	31.4±16.0	**0.025**
Mortality Rate (%)	11.8	13.9	0.611
EST rate (%)	69.3	68.7	0.923

BCR: BUN / Creatinine Ratio, EST: Erythrocyte Suspension Transfusion

Conclusion

We observed that UGB incidence increases in spring and emergency physicians need to be more prepared in that season. Moreover, it should be kept in mind that clinical and laboratory findings would be more serious during summer and spring when the temperature is high.

Conflict of Interest: We certify that there is no conflict of interest.

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