RESULTS OF GASTROINTESTINAL BLEEDING TREATMENT IN THE REPUBLIC OF KAZAKHSTAN OVER 10 YEARS

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Abstract

Gastrointestinal bleeding (GIB) remains a significant cause of hospitalization and mortality worldwide, including in Kazakhstan. This retrospective study analyzes the incidence, treatment outcomes, and mortality of GIB in the Republic of Kazakhstan over a 10-year period (2014–2023) using data from 101,703 patients across 254 medical institutions. The study differentiates between non-variceal and variceal GIB, highlighting a 24.5% increase in non-variceal cases and a 45.1% increase in variceal cases due to higher rates of acute ulcerative lesions and liver cirrhosis, respectively. Men were disproportionately affected, accounting for 69.3% of cases, with the highest incidence in the 18-59 age group. Despite a 27.8% increase in GIB cases, overall mortality decreased from 7.8% in 2014 to 5.0% in 2023, largely due to advances in endoscopic hemostasis and critical care management. The mortality rate for non-variceal GIB decreased to 3.0%, while variceal GIB decreased from 23.8% to 13.6%. The results underscore the need for improved prevention, especially in high-risk populations using NSAIDs and anticoagulants, and in those with chronic conditions such as liver disease.

Introduction

Gastrointestinal bleeding (GIB) remains a prevalent and dangerous complication of diseases affecting the digestive system, as well as other organs and systems. GIB is one of the leading causes of hospitalization and mortality worldwide.[1-4] According to the World Society of Emergency Surgery (WSES), the annual incidence of GIB ranges from 40 to 150 cases per 100000 population, with hospital mortality rates varying from 2% to 14%.[2,5,6]

According to the worldwide classification, GIB can be categorized into non-variceal and variceal GIB. The primary causes of non-variceal bleeding are peptic ulcers of the stomach and duodenum, "acute" symptomatic erosions and ulcers, as well as Mallory-Weiss syndrome. GIB of variceal etiology is a complication of liver cirrhosis and portal hypertension.[1-3,5,6]

In the United States, more than 300000 individuals are hospitalized annually due to GIB.[7] The mortality rate for gastrointestinal bleeding reaches up to 10%.[7,8] In our country, GIB is a leading cause of death, accounting for 17–25% of all fatalities in surgical wards.

According to studies by *Simon et al.,* the majority of GIB cases were caused by peptic ulcers of the stomach and duodenum (31–67%).[5] Erosive and ulcerative lesions of the upper gastrointestinal tract accounted for 7–31%, stomach tumors for 2–8%, and Mallory-Weiss syndrome for 4–8%.[5,6,8]

Over the past few decades, the patterns of morbidity and mortality from

GIB have undergone significant changes. Several factors could play role in these changes. For example, advancements in pharmacology and the consequent possibility for of *Helicobacter pylori* eradication, as well as improvements in intraluminal endoscopy, and enhanced management of critically ill patients in intensive care units have all played key roles in reducing the risk of GIB.[2,7]

On the other hand, several factors could contribute to an increased prevalence of GIB in the population. These include a higher average life expectancy, the growing prevalence of cardiovascular diseases and other serious conditions, as well as the uncontrolled use of certain medications, such as NSAIDs, antiplatelet agents, and anticoagulants, which significantly contribute to the rise in GIB cases[6].

In 2019, a study in Turkey examined the treatment outcomes of 652 patients with GIB across different periods. The patients were divided into two groups based on the treatment period: Group 1, consisting of 421 patients treated between 1993 and 1995, and Group 2, with 231 patients treated between 2015 and 2016. In the latter period, there was a significant increase in the number of elderly patients, as well as an increase in bleeding from acute ulcers in patients with comorbidities who were receiving anticoagulant therapy[7].

Another study conducted in Finland examined the incidence and mortality from GIB in the general population, analyzing 39054 patients from 1987 to 2016. The incidence of upper gastrointestinal tract bleeding varied annually, ranging from 40 to 66 cases per 100000 people. Overall mortality from GIB ranged from 4.7% to 10.1%, with an average of 7.0%.[9]

Between 1993 and 2005, a mortality analysis of upper gastrointestinal tract bleeding was conducted in China at the Chinese University of Hong Kong. A total of 9375 patients with non-variceal bleeding were treated, with a mortality rate of 577 patients (6.2%). Notably, most patients (460 or 79.7%) died from causes unrelated to the bleeding itself. The most common causes of death were terminal-stage malignant tumors (33.7%), multiple organ failure (23.9%), and lung diseases (23.5%). Heart diseases, including acute coronary syndrome and heart failure, accounted for 13.5% of the deaths, while cerebrovascular diseases contributed to 5.4% of the mortality.[10]

In Russia, a retrospective study of emergency surgical care was conducted over 17 years. From 2000 to 2017, there was a 31.4% decrease in the number of patients operated on for GIB. Postoperative mortality showed a slight reduction, from 12.8% in 2000 to 11.9% in 2017.[2]

The aim of the current study is to analyze the incidence and mortality of both non-variceal and variceal GIB in the Republic of Kazakhstan over the past 10 years. The findings of this study provide an assessment of the current state of GIB management and treatment in Kazakhstan.

Materials and Methods

A retrospective study was conducted at the A.N. Syzganov National Scientific Center of Surgery to analyze the treatment outcomes of patients with gastrointestinal bleeding (GIB) who were urgently hospitalized in 254 medical organizations across the Republic of Kazakhstan over a 10-year period.

The materials were extracted from the information system of the Ministry of Health's "Electronic Registry of Hospitalized Patients" (ERHP). Data were extracted from ERIP based on the main diagnosis of patients who were treated in emergency situations for GIB on surgical wards across the country from 2014 to 2023. The selection process was comprehensive, including the entire population. Ethical standards were upheld, and no personal patient information was disclosed.

A total of 101 703 patients were treated in the Republic of Kazakhstan over 10 years, of which 69.3% were men and 30.7% were women. The age of the patients ranged from 18 to 98 years. The incidence of GIB per 100 000 population increased from 52.3 in 2014 to 82 in 2023. Over 10 years, the number of non-variceal upper gastrointestinal bleedings increased by 24.5%, largely due to a rise in acute and symptomatic ulcerative lesions of the upper GI tract. The number of cases of variceal gastrointestinal bleeding increased significantly by 45.1%, reflecting a rise in liver cirrhosis and its complications in the country.

For the analysis of non-variceal upper gastrointestinal bleeding, the following ICD-10 codes were considered for the primary diagnosis:

K22.6 - Gastroesophageal laceration-hemorrhagic syndrome;

K25.0 - Acute gastric ulcer with hemorrhage;

K25.4 - Chronic or unspecified gastric ulcer with hemorrhage;

K26.0 - Acute duodenal ulcer with hemorrhage;

K26.4 - Chronic or unspecified duodenal ulcer with hemorrhage;

K27.0 - Acute peptic ulcer of unspecified location with hemorrhage;

K27.4 - Chronic or unspecified peptic ulcer with hemorrhage;

K28.0 - Acute gastrojejunal ulcer with hemorrhage;

K28.4 - Chronic or unspecified gastrojejunal ulcer with hemorrhage;

K92.0 - Hematemesis;

K92.1 - Melena;

K92.2 - Unspecified gastrointestinal hemorrhage.

For bleeding of "variceal" etiology, the following ICD-10 codes from surgical departments were used:

I85.0 - Esophageal varices with bleeding;

I85.9 - Esophageal varices without bleeding;

K70.2 - Alcoholic fibrosis and sclerosis of the liver;

K70.3 - Alcoholic cirrhosis of the liver;

K74 - Fibrosis and cirrhosis of the liver;

K76.6 - Portal hypertension.

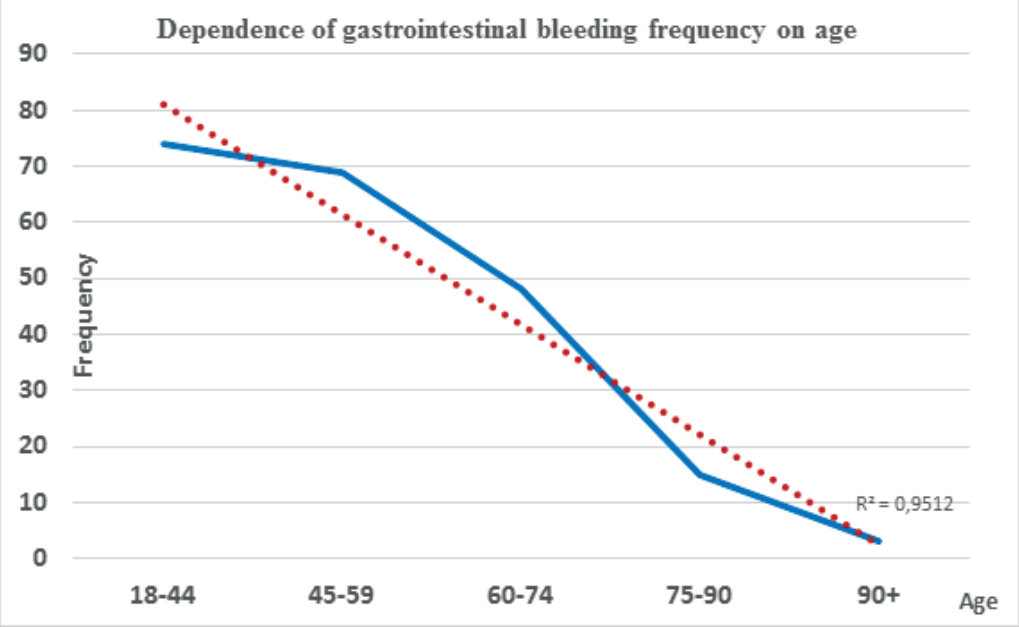
The study included individual cases of the disease, and a single patient could be included more than once if they were rehospitalized with a GIB diagnosis.

The following were excluded from the study: patients with lower gastrointestinal bleeding, rectal bleeding, patients under 18 years of age, and those admitted for planned (non-emergency) treatment.

Statistical Analysis The study carried out a correlation analysis using the Spearman method. Spearman's correlation coefficient (ρ) is -1.0. The relationship between the studied characteristics is inverse, and the strength of the relationship, according to the Chaddock scale, is functional.

The number of cases of gastrointestinal bleeding decreases inversely with age (Figure 1).

Figure 1.
Dependence of gastrointestinal bleeding frequency on age



As shown in Figure 2, the total number of treated GIB cases ranged from 8 978 in 2014 to 11 480 in 2023, an increase of 27.8%. By type of bleeding: 82.8% (84 223 cases) were non-variceal, and 17.2% (17480 cases) were variceal in origin. There was an increase in both non-variceal bleeding cases from 7 497 in 2014 to 9 331 in 2023 and variceal bleeding cases from 1481 in 2014 to 2 149 in 2023.

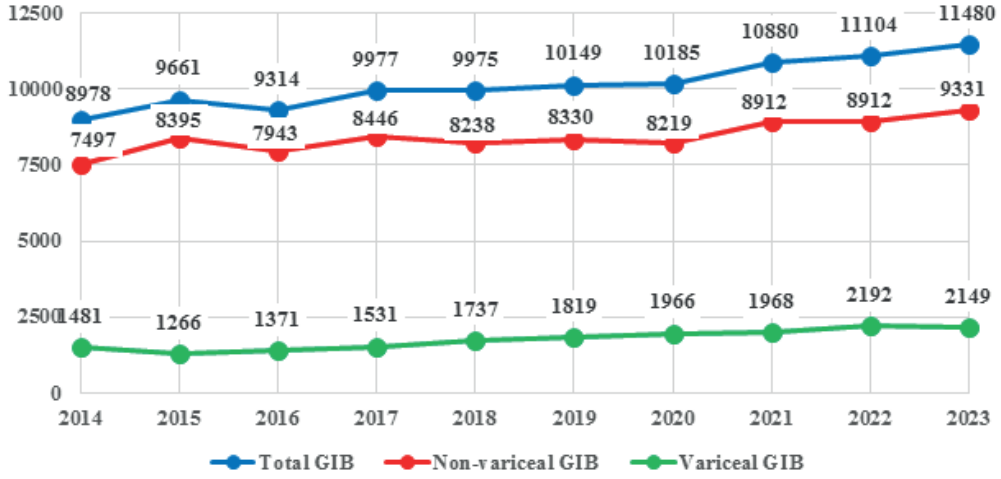


Figure 2.
Number of treated patients with GIB from 2014 to 2023. Results

Of the total number of treated patients, men accounted for 69.3% or 70 480 cases, while women accounted for 30.7% or 31 223 cases. The patients were classified according to the WHO age classification. The vast majority of the bleeding cases occurred in young and middle-aged individuals, from 18 to 59 years, making up 70.3% or 71 518 cases. Among those affected in this age group, 74.9% were men, equating to 53 565 cases. In the elderly, senile, and long-lived age groups, the proportion of men was 56.0%, or 16 915 out of 30 185 cases.

Table 1.
Distribution of Patients by Gender and Age

Age Number		Total		Male		Female	
		Proportion (%)	Number	Proportion (%)	Number	Proportion (%)	
Young	18-44	36 482	35.9	28 333	40.2	8 149	26.1
Middle-aged	45-59	35 036	34.5	25 232	35.8	9 804	31.4
Elderly	60-74	21 172	20.8	12 898	18.3	8 274	26.5
Senile	75-90	8 787	8.6	3 947	5.6	4 840	15.5
Longevity	90+	226	0.2	70	0.1	156	0.5
Total		101 703	100	70 480	69.3	31 223	30.7
* Age according to WHO classification							

Table 2 presents the number of treated cases and the mortality rate from GIB during the period from 2014 to 2023. There is a noticeable annual increase in the number of hospitalized patients with GIB. A gradual decline in mortality is observed, from 7.8% in 2014 to 5.0% in 2023. However, overall mortality from GIB remains high, primarily due to the high fatality rate from liver cirrhosis complications, such as bleeding from varicose veins in the esophagus and stomach.

Table 2.
Overall Mortality from Gastrointestinal Bleeding from 2014 to 2023

Years	Treated, total	Mortality, Total	Overall Mortality, %
2014	8 978	699	7.8
2015	9 661	827	8.6
2016	9 314	706	7.6
2017	9 977	642	6.4
2018	9 975	696	7.0
2019	10 149	698	6,9
2020	10 185	779	7.7
2021	10 880	773	7.1

2022	11 104	665	6.0
2023	11 480	577	5.0
Total	101 703	7062	6.9

Figure 3 illustrates the annual dynamics of fatalities from GIB from 2014 to 2023. Over the 10-year period, a total of 7 062 patients died from GIB. Fatal outcomes from non-variceal upper gastrointestinal bleeding occurred in 3 470 patients (49.1%). Variceal bleeding was the cause of death in 3 592 patients (50.9%). Throughout the 10 years, there has been a decline in the number of fatalities from both non-variceal GIB and variceal GIB.

Figure 3.
Number of Deceased Patients by Type of Gastrointestinal Bleeding from 2014 to 2023

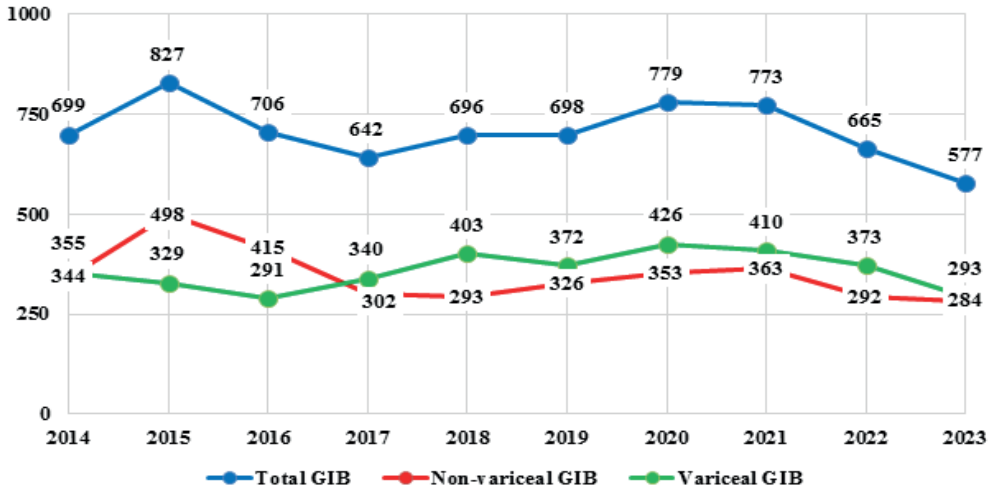
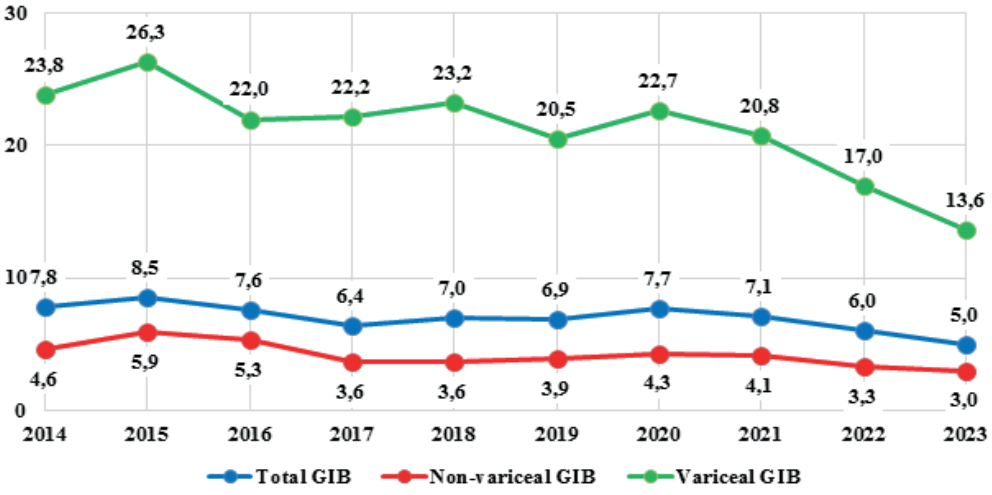


Figure 4 shows the 10-year trend in mortality for non-variceal upper gastrointestinal bleeding and variceal bleeding. Mortality from non-variceal bleeding decreased from 4.6% to 3.0%. A significant reduction in mortality from variceal bleeding was observed, from 23.8% in 2014 to 13.6% in 2023, which is attributed to improvements in treatment strategies and the widespread use of endoscopic hemostasis methods.

Figure 4.
Overall Mortality Rates from Different Types of Gastrointestinal Bleeding from 2014 to 2023



We studied the incidence and mortality associated with various types of non-variceal upper gastrointestinal bleeding. Depending on the etiological factors and pathogenesis, all non-variceal bleedings were divided into three major groups: bleeding from "acute" symptomatic ulcers, chronic ulcers, and Mallory-Weiss syndrome. Table 3 presents the number of treated patients and mortality rates for acute and chronic ulcers, as well as for Mallory-Weiss syndrome.

Years	Total upper Non-Variceal GIB		Acute Ulcers		Chronic Ulcers		Mallory-Weiss Syndrome	
	Treated	Mortality (%)	Treated	Mortality (%)	Treated	Mortality (%)	Treated	Mortality (%)
2014	7 497	344 (4.6)	4 462	226 (5.0)	1 705	89 (5.2)	1 330	29 (2.2)
2015	8 395	498 (5.9)	5 067	318 (6.3)	1 846	138 (7.5)	1 482	42 (2.8)
2016	7 943	415 (5.3)	4 704	268 (5.7)	1 791	112 (6.2)	1 448	35 (2.4)
2017	8 446	302 (3.6)	5 218	192 (3.7)	1 869	93 (5.0)	1 359	17 (1.3)
2018	8 238	293 (3.6)	5 130	189 (3.7)	1 765	92 (5.2)	1 343	12 (0.9)
2019	8 330	326 (3.9)	5 284	215 (4.1)	1 719	77 (4.8)	1 327	34 (2.6)
2020	8 219	353 (4.3)	5 227	231 (4.4)	1 603	85 (5.3)	1 389	37 (2.7)
2021	8 912	363 (4.1)	5 721	227 (4.0)	1 765	99 (5.6)	1 426	37 (2.6)
2022	8 912	292 (3.3)	5 801	175 (3.0)	1 684	89 (5.3)	1 427	28 (2.0)
2023	9 331	284 (3.0)	5 575	145 (2.6)	2 026	109 (5.4)	1 730	30 (1.7)
Total	**84 223 (100%)**	**3470 (4.1%)**	**52 189 (62.0%)**	**2186 (4.2%)**	**17 773 (21.1%)**	**983 (5.5%)**	**14 261 (16.9%)**	**301 (2.1%)**

Table 3.
Number of treated patients and mortality rates by types of upper non-variceal bleeding (2014–2023)

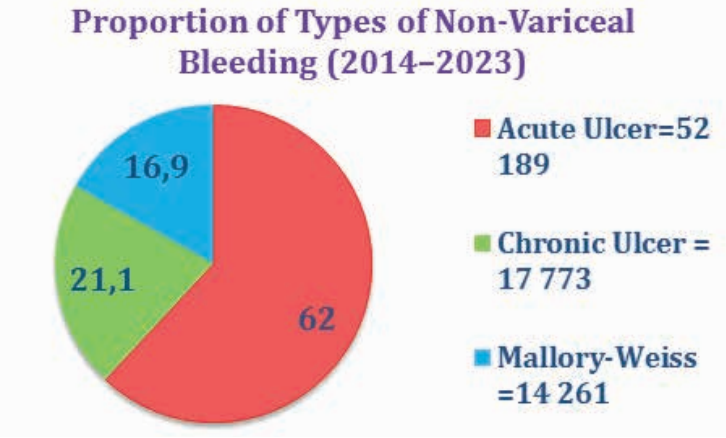


Diagram 1.
Proportion of treated cases by type of Non-Variceal Bleeding (2014–2023)

Diagram 1 shows the number and proportion of treated cases of non-variceal upper gastrointestinal bleeding from 2014 to 2023. The diagram clearly illustrates that acutesymptomatic ulcers are the primary cause of non-variceal bleeding. This group includes all cases of GIB not associated with peptic ulcers of the stomach and duodenum (chronic ulcers), as well as Mallory-Weiss syndrome.

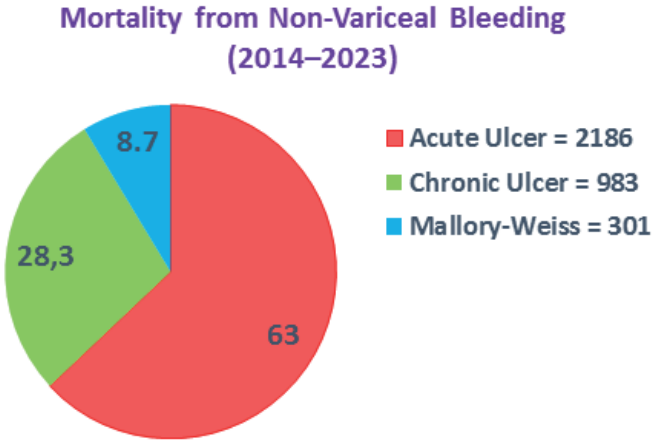


Diagram 2.
Mortality Rate Proportion by Type of Non-Variceal Bleeding (2014–2023)

Diagram 2 presents the distribution of mortality by type of non-variceal bleeding over 10 years. It shows that 63% of fatal outcomes were caused by bleeding from acute ulcers. This indicates a shift in the structure of gastro-

duodenal ulcer bleeding, with acute symptomatic ulcers now being the predominant cause, often as a complication of severe comorbid conditions. Many authors attribute these changes in the structure of non-variceal bleeding to the increased life expectancy of the population, the rise in comorbid pathologies, the widespread use of ulcerogenic medications in clinical practice, and the lack of a unified program for preventing acute erosive and ulcerative lesions of the gastrointestinal tract.[11,12]

The predominance of high mortality from acute symptomatic ulcers among all types of non-variceal bleeding is attributed to the severity of the underlying conditions of the patients.

Figure 5.
Mortality by Types of Upper Non-Variceal Bleeding (2014–2023)

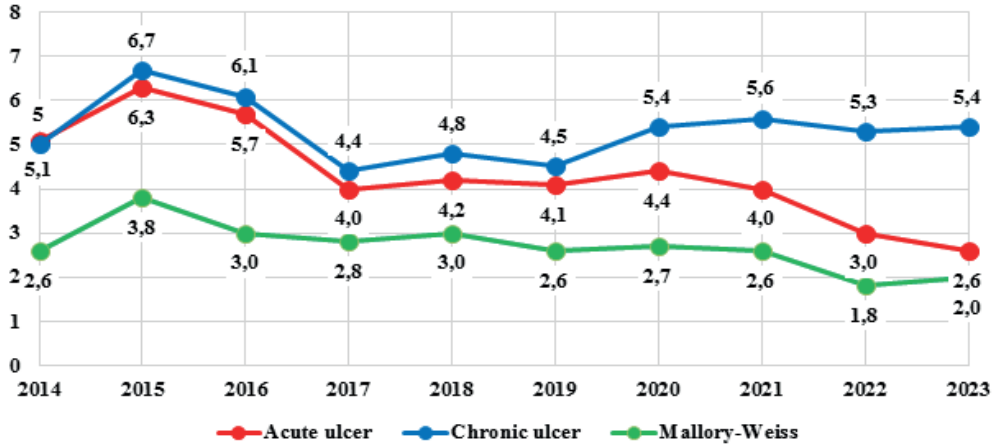


Figure 5 shows the dynamics of mortality from the main types of non-variceal bleeding from 2014 to 2023. From 2014 to 2023, there is a noticeable decrease in mortality by half for bleeding from acute ulcers. However, there is no downward trend in mortality for bleeding from chronic ulcers.

Diagram 3.
Mortality from GIB by Gender and Age

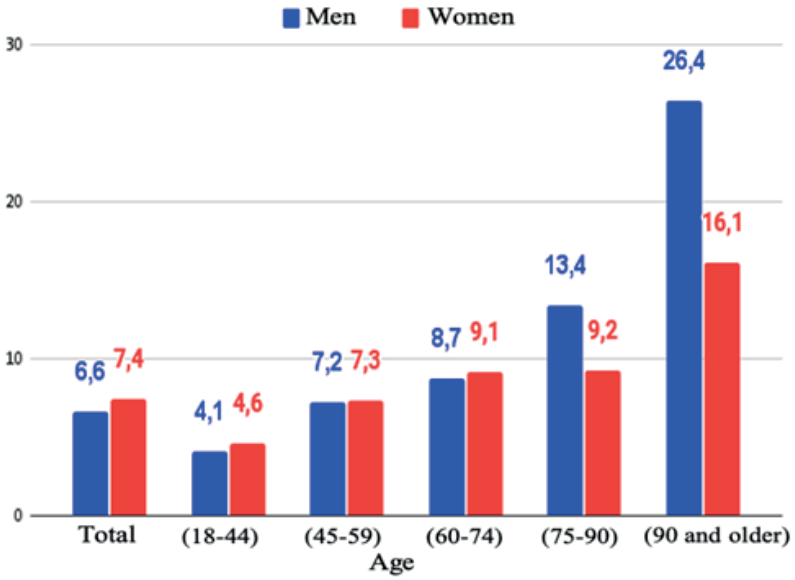


Diagram 3provides an analysis of fatalities from GIB by gender and age. A total of 70,480 men were treated, with 5,010 fatal outcomes, resulting in a mortality rate of 7.1%. Among women, the mortality rate was 6.6%, with 2052 deaths out of 31223 treated cases.

Discussion

Despite advancements in the treatment of peptic ulcers in the stomach and duodenum, the number of patients admitted to surgical hospitals with upper gastrointestinal bleeding remains quite high. Our research has shown that the incidence of gastrointestinal bleeding (GIB) in Kazakhstan increased from 52.3 per 100000 population in 2014 to 82 per 100000 in 2023.[7]

When analyzing patients by gender and age, the following was observed:

men accounted for 69.3% of the cases, while women made up 30.7%. A significant portion of GIB cases (70.3% or 71518 cases) occurred in individuals of working age (18–59 years).[13]

In terms of GIB types, 82.9% were non-variceal in origin, while 17.1% were variceal. The number of non-variceal bleedings increased by 24.5%, largely due to a rise in acute symptomatic ulcerations in the upper GI tract. The use of NSAIDs and antiplatelet agents, often in the context of severe comorbid conditions, is now seen as a key factor contributing to the formation of ulcers and the onset of bleeding. Severe comorbidities are also linked to increased mortality.[2]

Over the 10-year period, cases of variceal bleeding increased by 45.1%, rising from 1481 cases in 2014 to 2149 in 2023, indicating an increase in liver cirrhosis and its complications in Kazakhstan.

The proportion of fatal outcomes from non-variceal GIB over 10 years was 49.1% (3470 patients), while variceal GIB accounted for 50.9% of deaths (3592 patients).

Thanks to the implementation of comprehensive measures, the widespread use of endoscopic hemostasis, the development of new medications, and improved management of critically ill patients in intensive care units, overall GIB mortality decreased from 7.8% in 2014 to 5.0% in 2023. Acute symptomatic ulcers were more than twice as likely to be the source of bleeding compared to chronic ulcers.[3]

Limitations: The limitations of this study include its retrospective design, which may not provide the same depth of clinical analysis as a prospective study. The research was conducted using statistical data from the information system, which does not include data from clinical, laboratory, and instrumental examinations, nor details about the types of endoscopic hemostasis.

What's known? Gastrointestinal bleeding remains one of the most common problems faced by surgeons, endoscopists, and physicians from other specialties in clinical practice. Currently, despite all the advancements in modern pharmacology, endoscopy, and intensive care, gastrointestinal bleeding remains one of the most serious complications of many diseases and, in some cases, is an indication for emergency surgery. It is associated with significant morbidity, mortality, and an economic burden on healthcare.

What's new? This study allows us to assess the current situation regarding the prevalence of gastrointestinal bleeding in the Republic of Kazakhstan. The increase in morbidity highlights the importance of preventing gastrointestinal bleeding, particularly in patients with severe chronic conditions.

Conclusion

Based on the findings of this study, we observe a rise in the number of treated cases, which could be attributed to improved diagnostic methods, population growth, and the uncontrolled use of anticoagulants and antiplatelet agents, as well as an increase in the number of patients with ulcerative diseases and liver cirrhosis.

Men were predominant in the young and middle-aged groups, accounting for 70.3% of all GIB patients. The study also noted an increase in mortality with age, which is directly related to the onset of comorbidities and the chronic progression of existing conditions.

The results of this study provide a comprehensive assessment of the current situation in surgical services dealing with gastrointestinal bleeding in Kazakhstan and help identify trends in the treatment, surgery, and mortality rates of these patients. This can serve as a foundation for developing recommendations to improve the organization of these services, aiming to reduce morbidity and mortality from this condition. Further detailed investigation into the causes of high mortality and determining optimal treatment strategies are promising areas for future research.

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text of the article (material and methods, results). B.B., K.Sh. and D.M.: Writing the text of the article (introduction, discussion), approval of the final version of the article. I.A.: Design and control of the research. All authors approved the final version of the manuscript.

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