

# Risk Factors for Mortality Among Upper Gastrointestinal

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# Risk Factors for Mortality Among Upper Gastrointestinal Bleeding Patients : Literature Review

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## Abstract

**Background:** Upper Gastrointestinal Bleeding (UGIB) is a serious issue with a high frequency contributing to emergency service incidents and has the potential to be fatal if not properly addressed. Although the management of UGIB has progressed towards improvement, mortality rates have tended to remain within the range of 2% to 15% over several decades. It is known that most deaths in UGIB patients are not a direct result of the bleeding itself but rather associated with other factors. **Objective:** To identify the risk factors for mortality in UGIB patients. **Method:** This research involves a literature review in which researchers will assess articles relevant to predetermined criteria. Articles were screened based on titles, abstracts, keywords, populations, and the contents of the entire text, and seven of the most relevant articles were selected for review. **Results:** The findings of this study indicate that six literature sources meet the research criteria, and researchers have identified the most mentioned factors, including comorbidities and several conditions occurring in UGIB patients. **Conclusion:** Comorbidities, hypoalbuminemia, elevated levels of BUN or serum creatinine, and hemodynamic instability are the most frequently found risk factors for mortality in the compiled literatures.

Keywords: Upper Gastrointestinal Bleeding, Risk Factors, Mortality

## 1. Introduction

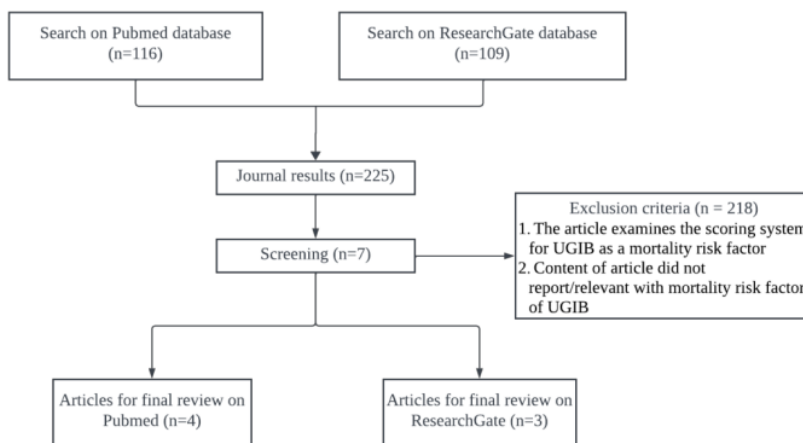
Upper Gastrointestinal Bleeding (UGIB) is an occurrence of blood loss that occurs in the proximal part of the ligament of Treitz, marked by the presence of melena or hematemesis [1]. In more severe cases of UGIB with significant blood loss, symptoms may include hematochezia [2]. Other symptoms that may arise in UGIB patients due to blood loss include hemodynamic instability, syncope, fatigue, and shortness of breath [1,2]. UGIB can occur due to several causes, and these causes are grouped into two categories: variceal and non-variceal etiologies [3]. The non-variceal group occurs due to mucosal structure damage that extends into blood vessels [4], which can be caused by various factors such as *Helicobacter pylori* (H Pylori) [3]. Meanwhile, the variceal group can occur as a complication of portal hypertension [5].

The incidence of Upper Gastrointestinal Bleeding (UGIB) in Europe occurs in 87 out of 100,000 people per year, with peptic ulcers being the most common cause [6]. Other studies show that the incidence of UGIB occurs in 80 to 150 out of 100,000 people per year, with a mortality rate of 2%-15% [7]. In 2009, the mortality rate in the United States of America (USA) was 2.1%, with variceal UGIB deaths more dominant than non-variceal, at 5.6% compared to 2.1% [8]. Meanwhile, research in Syria shows a different mortality rate, with a figure of 9.4% in the years 2018-2020 [9].

UGIB contributes significantly to the incidence of emergency services [10]. Several studies have shown that the mortality rate has remained in the range of 2%-15% over several decades [7]. It turns out that the occurrence of death in UGIB patients is not solely due to the bleeding itself but is associated with other factors [11]. These factors include comorbidities linked to occurrences of quicker mortality [14]. Various patient conditions are also related to UGIB mortality, such as hypoalbuminemia, increased BUN or serum creatinine, and hemodynamic instability [4, 12, 13]. This study aims to determine the risk factors for mortality among UGIB patients.

## 2. Method

This research is a literature review that will examine relevant articles based on predetermined criteria. Articles were gathered from searches using several search engines and major databases, namely PubMed and ResearchGate, by filtering the criteria for articles published from 2019 to 2023. The research articles found from these databases amounted to 225 articles, with 116 from PubMed and 109 from ResearchGate. These articles will undergo screening based on titles, abstracts, keywords, and inclusion and exclusion criteria. The keywords used for the article search were "mortality risk factor of upper gastrointestinal bleeding." The inclusion criteria were as follows: (1) published between 2019-2023, (2) articles are fully accessible (full text), (3) primary research, not a literature review, systematic review, or meta-analysis, and (4) the study's sample population comprises patients with a primary diagnosis of upper gastrointestinal bleeding (UGIB). An article was excluded if (1) it examines the scoring system for UGIB as a mortality risk factor or (2) the article did not report/relevant to the mortality risk factor of UGIB.



**Fig 1.** The articles selection process for review

Table 1: Article Summary Results

Research Title	Author	Study Design	Mortality Rate	Mortality Risk Factors of UGIB
Clinical mortality risk factors of variceal upper gastrointestinal bleeding in a Malagasy surgical intensive care unit	Rakotondrainibe et al	Cohort Retrospective	16.0%	Mortality of UGIB had a significant relationship with previous endoscopic band variceal ligation, tachycardia >120 bpm, and ascites (Rakotondrainibe et al., 2020).
Validation of a new risk score system for non-variceal upper gastrointestinal bleeding	Kim et al	Retrospective	4.9%	Result analysis was showed that mortality of UGIB was related to multiple comorbidities, BUN, creatinine, albumin, syncope at first visit, and endoscopic failure within 24 h during the first admission (Kim et al., 2020)
Can neutrophil-lymphocyte ratio predict mortality in acute non-variceal upper gastrointestinal bleeding?	Dertli et al	Retrospective	11.3%	High NLR at admission, and hy-potension at admission were shown to be independent risk factors affecting mortality (Dertli et al., 2022)
Prevalence, short term outcome and factors associated with survival in patients suffering from upper gastrointestinal bleeding in a resource limited-setting, the case of Mulago hospital in Kampala, Uganda	Kiringa et al	cross-sectional	16.7%	Uremia remained associated with mortality of UGIB in this study (Kiringa et al., 2020)
Incidence, Predictive Factors, Clinical Characteristics and Outcome of Non-variceal Upper Gastrointestinal Bleeding – A Prospective Population-based Study from Hungary	Lakatos et al	prospective one-year study	13.5%	Presentation with hemodynamic instability or presence of comorbidities was associated with mortality of UGIB (Lakatos et al., 2021)

Predictive Factors of Mortality in Patients with Nonvariceal Upper Gastrointestinal Bleeding	Sadiku et al	prospective study	10.7%	In this study, 95.8% of deaths were associated with comorbidities. Low red blood cell (RBC) and warfarin were found to be independent predictive factors for mortality (Sadiku et al., 2023)
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### 3. Discussion

Based on the search results, we have identified the 6 most relevant articles for review. The discussion section will elaborate on the most frequently significant risk factors for mortality among UGIB patients among the 6 selected articles, which are narrated in the following paragraphs.

#### a. Comorbidities

Comorbidities are associated with a decreased chance of patient prognosis; the presence of comorbidities can worsen a patient's condition, leading to faster mortality, necessitating more intensive patient management and increased treatment costs [14]. In a prospective observational study, comorbidities (Diabetes Mellitus and metastatic malignancy) were found to be related to 30-day mortality, underpinning the deaths of more than half of the patients [15]. Diabetes mellitus can be indicated by an HbA1C  $\geq 6.5\%$  or through fasting blood glucose  $\geq 7.0$  mmol/L (126 mg/dL) or blood glucose 2 hours after glucose administration  $\geq 11.1$  mmol/L (200 mg/dL) [16]. In another study, it was found that chronic liver disease significantly ( $p$  value= 0.017) correlates with the occurrence of mortality in SCBA bleeding patients in the emergency unit [4].

#### b. Hypoalbuminemia

Albumin is the most abundant protein in human plasma. Synthesized by the liver, albumin plays a crucial role in the physiological processes of the human body, including osmotic pressure regulation [17]. This crucial role necessitates the careful maintenance of normal body albumin concentrations, and abnormal serum albumin levels are closely associated with the risk of death [18]. Serum albumin is a vital blood component, and incidents of bleeding can lead to the loss of a portion of albumin [19]. Several studies indicate that a decrease in serum albumin is linked to mortality in cases of SCBA bleeding [4, 13]. In research on hypoalbuminemia associated with the incidence of SCBA bleeding, it was found that patients with serum albumin levels  $\geq 3.2$  g/dL had lower mortality compared to patients with serum albumin levels  $< 3.2$  g/dL [20].

#### c. Increase in BUN and/or Serum Creatinine

The relationship between an elevated BUN level and UGIB is explained as a manifestation of bleeding from the UGIB lesion, where the red blood cell component (protein hemoglobin) is broken down by digestive enzymes in the UGIB. This event leads to the absorption of amino acids (derived from hemoglobin) in the lower gastrointestinal tract, while urea (the end product of protein metabolism) is separated from damaged erythrocytes. This separation impacts increased urea absorption, resulting in high urea concentrations detected in the plasma [21]. The blood BUN level follows the amount of protein absorption in the digestive system, with UGIB being more dominant in nutrient absorption compared to the lower gastrointestinal tract [22]. Severe gastrointestinal

bleeding causes hypovolemia and dehydration, triggering a decrease in blood flow to the kidneys. This, in turn, increases the kidney's response to reabsorb urea, reducing excretion and disproportionately raising creatinine levels [23]. In addition to the six selected articles, a relationship between an increase in BUN and/or creatinine levels and UGIB patient mortality was identified [13].

#### d. Hemodynamic Instability

Evaluation of hemodynamic is included in the initial management of UGIB patients with the goal of ensuring adequate oxygen delivery to the tissues in need [24]. The patient's hemodynamic stability is measured based on several components in clinical examination, including pulse rate, respiratory rate, blood pressure, temperature, urine output, and capillary refill time (CRT) [25]. The body compensates by increasing heart contractility, activating baroreceptors leading to sympathetic nervous system activation and vasoconstriction, decreasing systolic pressure, and consequently increasing pulse rate due to this imbalanced condition [26]. Insufficient blood flow due to hemodynamic instability can disrupt physiological processes in the body, leading to hemodynamic collapse, organ dysfunction, and potential patient death [27]. One condition of hemodynamic instability, namely hypotension, is associated with UGIB patient mortality, especially in elderly patients (Emektar et al., 2020). Additionally, other studies reveal that tachycardia is significantly related to patient mortality [12].

#### 4. Conclusion

Based on the six selected literatures, several risk factors for mortality among UGIB patients were identified. After reviewing these six articles, it was found that comorbidities, hypoalbuminemia, an increase in BUN or serum creatinine levels, and hemodynamic instability are the most frequently encountered risk factors for mortality in the compiled journals. The identification of these risk factors for mortality in UGIB patients is expected to provide new knowledge for medical practitioners in managing UGIB, and can be potential to reducing the mortality rate.

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