

## Research Article

# Hemostasis in the Critical Patient in Medical Resuscitation

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## Abstract

Hemostasis disorders are frequently observed in intensive care. The objective of this study is to determine the incidence, etiologies and management to reduce the risk of Morbi-mortality. Through a retrospective, descriptive and analytical study of a series of 50 patients hospitalized in the medical intensive care unit from the Faculty of Medicine and Pharmacy, Hassan II University of Casablanca, from 1st January to 30 July 2019, we studied the epidemiological characteristics, clinical, prognostic and management for patients with hemostasis assessment disorders.

One hundred and fifty files were collected, 50 of which presented a hemostasis disorder. Male patients (58%) were the most affected, with an average age of 49.98 ± 18.8 years. Fourteen patients presented a hemorrhagic sign at admission, hemoptysis is the most common symptom. The various hemostasis disorders were: decrease in prothrombin rate (66%), an elongated activated cephalin rate (46%), decrease in fibrinogen rate (20%) and thrombocytopenia (58%).

Most hemostasis disorders were present in the course of infectious pathology (44%) whose management consisted of the administration of antibiotic therapy (84%), transfusion of fresh frozen plasma (12%), platelet bases (14%) and administration of vitamin K1 (12%). A prevalence of 60% mortality was found and an average length of stay of 8.92 days. At the univariate analysis of hemostasis, a prothrombin rate less than 50% (P=0.001) and an elongated activated headche time (P=0.03) appear as factors of excess mortality in our population. The existence of hemostasis disorders in intensive care is a prognostic factor requiring early and adequate screening and management to reduce the mortality rate.

**Keywords:** Hemostasis disorder; Critical patient; Medical resuscitation; Epidemiology; Mortality

## Introduction

Hemostasis disorders are the expression of a constitutional or acquired dysfunction of the different mechanisms of physiological hemostasis and whose consequences can affect several organs. They can motivate admission to intensive care or occur in the course of various serious conditions, and can be associated with a high hemorrhagic and/or thrombotic risk, an increase in the consumption of transfusion products and excess mortality.

A better knowledge of the epidemiological data of these anomalies, their pathophysiology and their diagnostic approach makes it possible to establish a better preventive and therapeutic management. The objective of this study was to determine the prevalence and management as well as the evolution of various hemostasis disorders in medical intensive care.

## Materials and Methods

This is a retrospective, descriptive and analytical study over 6 months from January 1<sup>st</sup> to June 2019, by consulting the medical records of patients admitted to medical intensive care from the Faculty of Medicine and Pharmacy, Hassan II University of Casablanca. The patients included in this study have an age greater than or equal to 15 years, with hemostasis assessment upon admission (PR, ACR, INR, platelet count) and an exploitable medical record. Excluded

were patients with previous hemostasis disorders, malignancies and patients on chemotherapy.

Parameters analyzed were age, sex, admission pattern, comorbidities, severity scores: APACHEII (Acute physiology and chronic health evaluation), SAPSII (Simplified Acute Physiology Score), SOFA (Sequential Organ Failure Assessment), clinical and biological characteristics, management and evolution. The data were recorded on the basis of the register of Microsoft's Excel software and statistical analysis made using SPSS 21.0 software.

We conducted a univariate analysis whose objective is to determine the predictive factors of mortality in intensive care in patients with at least one hemostasis disorder (a p value less than 0.05 was retained significant). Our results are expressed in average standard deviation or with extremes and in percentage.

## Results

During the study period (6 months), 150 medical records were retained with 33.33% of hemostasis disorders found (thrombocytopenia, elongated ACR, decrease in PR, high INR) without prior drug intake altering hemostasis. On the epidemiological profile, we have a male predominance at 58%. The average age is 49.98 18.8 with extremes ranging from 15 to 84 years. Seventy percent of patients had a history of disease. Medical history is dominated by diabetes (30%) and high blood pressure (20%). Regarding the reason for admission, there is a predominance of infectious pathologies (44%) followed by metabolic and neurological pathologies, respectively 30% and 10%.

The duration of hospitalization was 8.92 days, with extremes ranging from 1 to 71 days. Fourteen patients presented a hemorrhagic sign at admission; hemoptysis represents the most frequent symptom (35.71%), followed by hematemesis (21.42%) and rectorrhagia (14.28%). For severity scores, the average APACHEII score was 12 4.25 with extremes from 0 to 26. The average SAPSII was 22.42, 7.83 with extremes from 5 to 35. The average SOFA score value was

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3.64, 2.4 with extremes from 0 to 9. The various hemostasis disorders (Figure 1) were: a decrease in prothrombin rate (66%), a rate of elongated activated cephalin (46%), a low rate of fibrinogen (20%) and thrombocytopenia (59%).

Management in our department consisted of antithrombotic treatment: 74% of patients received heparin therapy; 70% received LMWH (low molecular weight heparin) and 4% received HNF (unfractionated heparin), administration of vitamin K (12%), platelet inhibitors (6%), transfusion of fresh frozen plasma (12%), platelet bases (14%) and administration of VKA-type anticoagulants (1 patient).

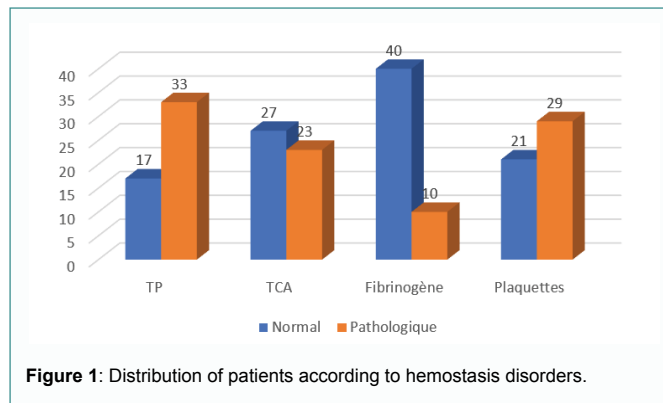


Figure 1: Distribution of patients according to hemostasis disorders.

Most hemostasis disorders were present in the course of infectious pathology (44%), whose antibiotic therapy was recommended in 84% of patients, mainly ceftriaxone (54.76%), ciprofloxacin (28.57%) and imipenem (14.29%). After 5 days of ceftriaxone treatment, 21% of patients had a decrease in PR and 17% had an extension of ACR. Thirty three percent of patients treated with ciprofloxacin developed thrombocytopenia after 5 days of use.

The evolution favorable state in 20 patients, of which 10 survived without complications and transferred to another department. Sixty percent of patients had complications during their stay in intensive care; the various complications are listed in the Table 1.

The main sites of nosocomial infections in our series were pneumonia (37.04%) followed by bacteremia (33.33%) and urinary tract infection (18.52%). During the study period, 60% of patients with hemostasis disorder died. In univariate analysis of hemostasis, PR less than 50% and elongated ACR appear as factors of excess mortality in resuscitation (Table 2).

According to our statistical analysis of patients according to the evolution of hemostasis parameters (TR and ACR), the aggravation of these parameters to a P significant value, with an increased mortality rate (Table 3).

The occurrence of nosocomial infection is significantly associated with excess mortality (P 0.0001). Intubation is statistically a factor of excess mortality for patients with hemostasis disorders (P 0.0001). The use of vasoactive amines (P 0.0001) is also correlated with excess mortality in these patients. However, heparin therapy (P=0.09), corticosteroid therapy (P=0.59) and blood transfusion are not statistically correlated with excess mortality.

## Discussion

Hemostasis disorders in intensive care are of multifactorial origin and constitute a permanent etiological and therapeutic challenge

Table 1: Complications in patients during hospitalization.

Complications		N	%
Hemorrhagic complication (purpuric lesions)		4	8
Thromboembolic complication (8%)	Pulmonary embolism	3	6
	Deep vein thrombosis	1	2
Infectious complication (48%)	Gram-negative bacilli	19	38
	Gram positive cocci	5	10

Table 2: Univariate analysis of the quantitative variables of hemostasis assessment.

		Evolution		P-VALUE
		Death	Survivor	
50% PR 70%	Headcount %	10	8	0.051
		55.6	44.4	
PR less than 50%	Headcount %	13	2	0.001
		86.7	13.3	
ACR elongated	Headcount %	18	5	0.032
		78.3	21.7	

Table 3: Univariate analysis of the evolution of hemostasis.

Aggravation		Evolution		Value-P
		Death	Survivor	
PR	Headcount %	13	3	0.035
		81.3	18.8	
ACR	Headcount %	11	0	0.007
		100	0	

Table 4: Comparison of hemostasis assessment parameters with other studies.

Author	Thrombocytopenia (%)	Low PR (%)	ACR (%)
Bennani [5]	12	12.47	12.9
Kaikat [14]	-	15.22	15.65
Girich [13]	80	47	42
Chakraverty et al. [4]	38	66	29
Our study	19	22	15

for the resuscitator. Indeed, the underlying pathology for which the patient is admitted, can be associated with a multi visceral failure or complication of treatment. Hence the need for early assessment of the risk of hemostasis disorder and appropriate and optimal management of these resuscitation abnormalities [1].

The prevalence of hemostasis disorders during hospitalization in intensive care varies between 10% and 66% according to the studies, in our study, the prevalence was 33%. Advanced age is usually accompanied by more chronic diseases and increased susceptibility to complications, hemostasis disorders are no exception to this rule. In our series, the average age of patients was 49 years. It is a young population, consistent with the results of a study of RIHANI (49 years) conducted in an intensive care unit in Morocco [2]. In the AIHUA series, the average age was 67 years, which is consistent with the THIMOTHY study which reports an average age estimated at 60.8 years.

Among all patients retained, there is a male predominance of 58% with a sex ratio (H/F) at 1.38. This predominance is found in other studies. However, in the LALAINA study, there is female predominance [3]. In the CHAKRAVERTY series [4], cardiovascular involvement is the most frequent reason for admission, whereas in our study, infectious pathology is the most frequent reason. In our series, we found a concordance between the severity scores APACHE II, SAPS II, SOFA and the mortality rate. The following table reports averages of severity scores for other authors.

Thrombocytopenia, low PR and elongated ACR are present respectively in 19%, 22%, 15% of patients hospitalized in intensive care, which is consistent with the Bennati study (Table 4) [5]. Resuscitation

patients are particularly exposed to the risk of developing venous thromboembolic disease, due to many factors often combined. Thus, a prevention strategy is commonly used in these situations [6]. In our series, 75% of patients with hemostasis disorders were on preventive dose heparin therapy. In the OUAZZANI series, 65% of patients were on preventive anticoagulant treatment [7]. The PROTECT study found that there is no significant difference between FSH and LMWH in the prevention of BAT in resuscitation. Platelet antiaggregant are a new avenue of research for the prevention of thromboembolic complications in post-traumatic pathology. Aspirin is the only type used for the prevention of thromboembolic complications, but its use remains controversial. Vitamin K administration reduces the risk of developing hypovitaminosis K and its complications [8].

Transfusion practices may vary from one institution to another, but they are common in intensive care units [9]. In the AGARWAL study, 36% of patients with digestive hemorrhage treated with PFC [10]. In the MAN-KA ZHANG series, there is a significant association between mortality and platelet transfusion in patients with thrombocytopenia between 30,000 and 50,000 [11].

In our series, the average duration of hospitalization in patients with hemostasis disorders is 9 days, this result is similar to that of Chakraverty et al. [4], which reports a stay of 6 days against Rajadhyaksha et al. [12] reports that the average length of stay was 4 days. The mortality rate varies from one service to another, depending on the type of recruitment specific to each service, the pathophysiological characteristics of the patients recruited and the quality of care provided. In our series, the mortality rate was 60% in patients with hemostasis disorders. This result is consistent with the series of Rihani [13] and Rajadhyaksha et al. [12]. Our study was limited by the absence of complete exploration of hemostasis such as heparin assay and anti-Xa activity that are not technical at the laboratory level.

## Conclusion

Hemostasis disorders often complicate the management of patients in intensive care. A good clinical evaluation and well conducted hematological examinations will allow adequate management compromising the patient's progress thus reducing morbidity and mortality.

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