Thrombocytopenia in Critically Ill Adult Patients in Medical Intensive Care Unit (ICU): Frequency and Risk Factors in King Fahad Central Hospital, Jazan, KSA

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Citation: Rania Osman A, Ali H, Musa H, Ali N (2019) Thrombocytopenia in Critically Ill Adult Patients in Medical Intensive Care Unit (ICU): Frequency and Risk Factors in King Fahad Central Hospital, Jazan, KSA. J Intensive & Crit Care Vol.5 No.3:12

Abstract

Background: Thrombocytopenia is defined as a platelet count of less than 150×10^9/l. The various comorbidities in the severely ill patient affect platelet homeostasis, and consequently, thrombocytopenia is very common in critically ill patients treated in the ICU.

Objective: To assess the frequency of thrombocytopenia in patients admitted to the medical intensive care unit (ICU) of King Fahad Central Hospital and its risk factors, during the period from October 2018-January 2019.

Methodology: Data were collected from 160 adult patients admitted to the ICU. The baseline platelet count was measured and was repeated every other day (for one-week) during the ICU stay period. Thrombocytopenia was defined as platelet count of less than 150×10^9/l.

Results: Among 160 critically ill patients admitted to ICU, 92 (57.5%) were males and 68 (42.5%) were females. The majority of them 72 (45%) found in age group >60 years. The mean of platelets at admission was 237.6 ± 4.6 and after one-week the mean of platelets was 121 ± 31.8 (P=0.000). The prevalence of thrombocytopenia was 70%. Thrombocytopenia was significantly developed in the patients found in age group >60 years (50%) (P=0.008). The occurrence of thrombocytopenia was significantly high in the patients received thromboprophylaxis (75%; P=0.000), antibiotic (89.3%; P=0.000), sedation and mechanical ventilator support (50%; P=0.003). Additionally the SOFA score was significantly high in the patients with thrombocytopenia (5.0 ± 0.2 vs. 3.7 ± 0.3; P=0.002) and all the patients (n=4; 100%) with score 10-12 and the most of the patients (85.7%) with score 7-9 developed thrombocytopenia (P=0.046).

Conclusion: Thrombocytopenia is common in critically ill patients admitted in the ICU. Also, thrombocytopenia was significantly associated with elders, in addition to the patients received thromboprophylaxis, antibiotic, sedation and mechanical ventilator support as well as the patients with higher SOFA score.

Keywords: Intensive Care Unit; Platelets; Thrombocytopenia; Critical ill

Introduction

Thrombocytopenia is defined as a platelets count <150,000/mm³. It is the commonest hemostatic disorder in the ICU-admitted patients affecting around half of them [1]. Severe thrombocytopenia is when the platelets count drops below 50,000/mm³. It affects around 2-15% of the critically ill patients [2].

The mechanism for the development of thrombocytopenia can either be central, peripheral or mixed. Individuals with a central cause tend to bleed, while those with a peripheral cause are at

risk of thrombosis. Further, it can be classified as acquired or genetic.

There are many risk Factors for the development of thrombocytopenia that include: sepsis, male gender, use of inotropes, high severity of illness, renal replacement therapy, liver failure, and drug induced. And it has been found that sepsis and trauma are the commonest causes for thrombocytopenia in the ICU [3]. A decrease in the platelets count is directly linked to sepsis. Thus, the platelets count is incorporated in the Sequential Organ Failure Assessment (SOFA) score [4].

Though there are many known causes for thrombocytopenia, the cause of thrombocytopenia cannot be clearly identified in more than half of the critically ill patients. This etiology unknown thrombocytopenia, found in critical illnesses (e.g. sepsis, septic shock, and trauma) has been termed as "thrombocytopenia in critically ill patients" TCIP. And it's suspected to be a predictor of poor prognosis in these patients [5]. In this study we aimed to examine this relation in an observational manner in the medical ICU of King Fahad Central Hospital, as to have a local view of this issue.

Methodology

Study design

A cross sectional study was conducted over four months in King Fahad Central Hospital; in the period from October 2018-January 2019. This study was enrolled 160 critically ill patients admitted to ICU. Personal data, admitting diagnosis, presence of co-morbidities, thromboprophylaxis use, antibiotic use, sedation and mechanical ventilator support, in addition to SOFA score were collected. The baseline platelet count was measured and was repeated every other day (for one-week) during the ICU stay period. Thrombocytopenia was defined as platelet count of less than 150x109/l.

Inclusion and exclusion criteria

All patients who were hospitalized in the ICU during the data collection day were included. Patients with a platelets count <150,000/mm³ upon admission to the ICU and those with an admitting diagnosis of coagulopathy were excluded.

Statistical analysis

The study variables were analyzed using SPSS 21.0 (IBM Corp., Armonk, NY, USA) and presented as frequencies with percentages. Qualitative data is going to be analyzed using the Chi-Square test and P-value considered significant if <0.05.

Results

A total of 160 critically ill patients admitted to ICU were participated in the present study. 92 (57.5%) were males and 68 (42.5%) were females. The majority of them 72 (45%) found in age group >60 years (**Table 1**).

Concerning to the clinical characteristics, the majority of the patients 64 (40%) had hypertension. Also, 104 (65%) received

**Table 1** Showed the age and gender of the critically ill patients admitted to ICU (N= 160)

	Number	**%**
Gender		
• Male	92	57.5
• Female	68	42.5
Age		
• <40	52	32.5
• 40-60	36	22.5
• >60	72	45.0

Table 2 Showed the clinical characteristics of the critically ill patients admitted to ICU (N= 160)

	Number	**%**
Comorbidities		
• Hypertension	64	40.0
• DM	44	27.5
• Thyroid dysfunction	8	5.0
• CVD	24	15.0
• Renal diseases	12	7.5
Thromboprophylaxis use	**104**	**65.0**
Antibiotic use	**116**	**72.5**
Sedation and mechanical ventilator support	**68**	**42.5**
SOFA score (mean ± SD)	**(4.6 ± 2.1)**	
• 0-6	128	80.0
• 7-9	28	17.5
• 10-12	4	2.5

thromboprophylaxis, 116 (72.5%) received antibiotics and 68 (42.5%) underwent sedation and mechanical ventilator support. In SOFA scoring, the mean of the patients was 4.6 ± 2.1 and the most of the subjects 128 (80%) found in score range from 0-6 (**Table 2**).

Concerning the admitting diagnosis, the majority of the patients had respiratory system diseases (**Figure 1**).

Figure 1 Diagnosis of the critically ill patients admitted in ICU (N=160)
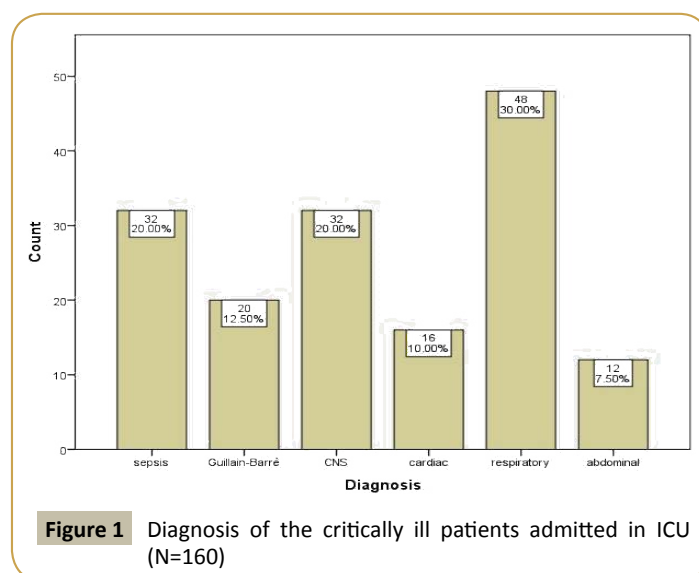
In the platelets counts among the study participants, the mean of platelets at admission was 237.6 ± 4.6 and after one-week the mean of platelets was 121 ± 31.8. The difference was statistically significant (P=0.000) (**Table 3**).
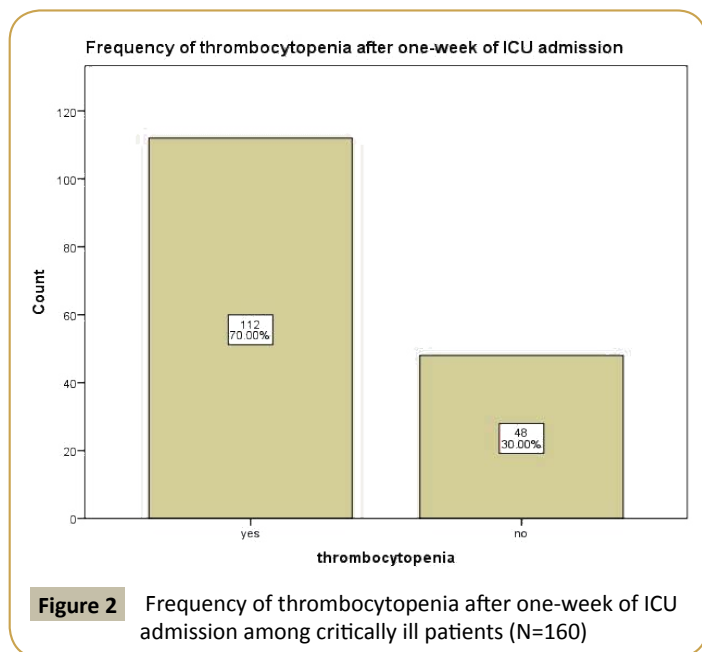
According to the development of thrombocytopenia, 112 (70%) of the critically ill patients admitted to ICU had thrombocytopenia (**Figure 2**).

The age of the patients was significantly associated with the development of thrombocytopenia as the majority of thrombocytopenia developed in the patients found in age group >60 years (50%) (P=0.008). Additionally, the gender showed in significant association with the development of thrombocytopenia (P=0.140) (**Table 4**).

In same manner, the admitting diagnosis of the patients

Table 3 Showed the means of platelets counts at admission and after one-week among critically ill patients (N= 160)

	At admission	After one-week	P value
	(mean ± SD)	(mean ± SD)	
Platelets count (10^9/l)	237.6 ± 4.6	121 ± 31.8	0.000

Figure 2 Frequency of thrombocytopenia after one-week of ICU admission among critically ill patients (N=160)

Table 4 Showed the association between development of thrombocytopenia with age and gender of the critically ill patients admitted to ICU (N= 160)

	Thrombocytopenia		
	Yes (n= 112)	No (n= 48)	P value
Gender			
• Male	68 (60.7%)	24 (50%)	
• Female	44 (39.3%)	24 (50%)	0.140
Age			
• <40	28 (25%)	24 (50%)	
• 40-60	28 (25%)	8 (16.7%)	
• >60	56 (50%)	16 (33.3%)	**0.008***
***P. value is significant (< 0.05)**			

Table 5 Showed the association between development of thrombocytopenia and admitting diagnosis of the critically ill patients admitted to ICU (N= 160)

	Thrombocytopenia		
	Yes (n= 112)	No (n= 48)	P value
Sepsis	24(21.4%)	8(16.7%)	
Guillain-Barré	16(14.3%)	4(8.3%)	
CNS	20(17.9%)	12(25%)	
Cardiac	12(10.7%)	4(8.3%)	
Respiratory	36(32.1%)	12(25%)	
Abdominal	4(3.6%)	8(16.7%)	0.059

was no significantly associated with the development of thrombocytopenia (P=0.059) (**Table 5**).

Regarding the association between thrombocytopenia and clinical characteristics of the patients; there was insignificant relationship between the thrombocytopenia and the presence of co-morbidities (P>0.05). Moreover, the occurrence of thrombocytopenia was significantly high in the patients received thromboprophylaxis (75%; P=0.000), antibiotic (89.3%; P=0.000), sedation and mechanical ventilator support (50%; P= 0.003). Additionally the SOFA score was significantly high in the patients with thrombocytopenia (5.0 ± 0.2 vs. 3.7 ± 0.3; P=0.002) and all the patients (n=4; 100%) with score 10-12 and the most of the patients (85.7%) with score 7-9 developed thrombocytopenia (P=0.046) (**Table 6**).

Discussion

Although thrombocytopenia appears as a common finding in the ICU, yet it is still unclear whether thrombocytopenia is the cause or just a risk factor for ICU-related mortality. The present study demonstrated that the incidence of thrombocytopenia of at least one platelet count of less than 150×109/l was 70% among medical patients in ICU. Our finding was found in the range of the occurrence of thrombocytopenia in ICU patients (35% to 80%) [6].

Table 6 Showed the association between development of thrombocytopenia and clinical characteristics of the critically ill patients admitted to ICU (N= 160)

	Thrombocytopenia		
Comorbidities	Yes	No	P Value
• Hypertension	44(39.3%)	20(41.7%)	0.425
• DM	32(28.6%)	12(25%)	0.398
• Thyroid dysfunction	6(5.4)	2(4.2%)	0.641
• CVD	20(17.9%)	4(8.3%)	0.093
• Renal diseases	10(8.9%)	2(4.2%)	0.536
Thromboprophylaxis use	**84(75%)**	**20(41.7%)**	**0.000***
Antibiotic use	**100(89.3%)**	**16(33.3%)**	**0.000***
Sedation and mechanical ventilator support	**56(50%)**	**12(25%)**	**0.003***
SOFA score (mean ± SD)	**5.0±0.2**	**3.7±0.3**	**0.002***
• 0-6	84(65.5%)	44(34.4%)	
• 7-9	24(85.7%)	4(14.3%)	
• 10-12	4(100%)	0(0%)	**0.046***
***P. value is significant (< 0.05)**			

Our results were also found higher than the findings of Mohammad A, et al. (20%) [7] and Divya K, et al. (67.5%) [8]. these variations in the frequencies of thrombocytopenia might be referred to the differences in geographical areas, origins, techniques used and sample sizes.

There was no difference between thrombocytopenic and nonthrombocytopenic patients in terms of age, in which one the majority of the patients developed thrombocytopenia were elder patient (>60 years) (P=0.008). These findings were agreed with the results of Richard S. et al who stated There was difference between thrombocytopenic and nonthrombocytopenic patients in terms of age, as elder patients (>55 years) tend to developed thrombocytopenia than other (P<0.05) [9]. In other side our study failed to assess significant association with gender.

The preset study also showed that, the occurrence of thrombocytopenia was significantly high in the patients received thromboprophylaxis (75%; P=0.000). Similar findings were obtained by Williamson D. et al. The risk of thrombocytopenia was higher in patients who received LMWH thromboprophylaxis [10].

Also the current study showed that, antibiotic (89.3%; P= 0.000), Sedation and mechanical ventilator support (50; P= 0.003), and the SOFA score (5.0 ± 0.2 *vs*. 3.7 ± 0.3; P= 0.002) were independently associated with the development of thrombocytopenia in critically ill patients. Our results were gone in same line with the studies of Mohammad A et al. [7] and Divya K et al. [8].

ICU admission indications and presence of comorbidities did not differ in thrombocytopenic and nonthrombocytopenic patients (P>0.05). This was in agreement of the study of Mohammad A et al. [7].

Conclusion

The present study concluded that, thrombocytopenia is common in critically ill patients admitted in the ICU. Also, thrombocytopenia was significantly associated with elders, in addition to the patients received thromboprophylaxis, antibiotic, sedation and mechanical ventilator support as well as the patients with higher SOFA score. Recording of the baseline platelet count for critically ill patients admitted to the ICU is recommended with further continuous monitoring of the platelet count during the whole ICU stay.

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