



Research Article

Prevalence of Intensive-care-unit-acquired Thrombocytopenia in a Tertiary Care Hospital in Sudan

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ABSTRACT

Thrombocytopenia is a common finding in patients admitted to the Intensive Care Unit (ICU). This can be attributed to the wide spectrum of comorbidities that affect homeostasis in these patients. The aim of this study was to estimate the frequency of thrombocytopenia among patients admitted to the medical ICU of Omdurman Military Hospital, Sudan. An observational descriptive hospital-based cross-sectional survey was conducted to calculate the prevalence of ICU-acquired thrombocytopenia among patients admitted to the medical ICU of Omdurman Military Hospital. Patients were excluded if they had a platelet count $<150,000/\text{mm}^3$ upon admission or if their platelet count dropped below that level <5 days post-admission. Among 160 patients, 112 (70%) developed thrombocytopenia. The mean platelet count upon admission was $237,600 \pm 4,600/\text{mm}^3$. The use of thromboprophylaxis, antibiotics, sedation, and mechanical ventilatory support was significantly correlated with the drop in platelet count ($p < 0.05$). The study is probably the first of its kind to draw attention to the magnitude of ICU-acquired thrombocytopenia in Sudan. The results showed a significant impact of the blood disorder in the critical care setting. Several factors have been associated with the abnormality. The development of thrombocytopenia can carry unfavourable outcomes in terms of morbidity and mortality. Therefore, the detection of this abnormal parameter needs a prompt response.

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1. INTRODUCTION

Thrombocytopenia defined as a platelet count $<150,000/\text{mm}^3$ [1–4] is the commonest haemostatic disorder in patients admitted to the Intensive Care Unit (ICU), affecting 20–40% of them [5]. In Egypt, the blood disorder has been found to affect 20% of the patients admitted to the ICU. It has been linked to higher mortality, increased transfusion requirements, and higher risk for developing septic shock [6]. In India, the prevalence of ICU-acquired thrombocytopenia was found to be 37.57% [2].

Differences in the literature concerning the magnitude of ICU-acquired thrombocytopenia can be attributed to research design, study setting, and geographical location. Surgical ICU patients seem to have a higher incidence of severe thrombocytopenia, compared with those in the medical ICU. However, most studies have been performed in mixed surgical/medical ICUs, making definitive conclusions difficult [5].

Although there are many known causes of thrombocytopenia, it cannot be clearly identified in more than half of critically ill patients. It develops in the context of infection, inflammation, and depletion of coagulation factors. The unknown aetiology of thrombocytopenia seen in the ICU has been termed as thrombocytopenia in critically ill patients. It is thought to be a poor prognostic indicator [7].

Thrombocytopenia is an important parameter in patients admitted to the ICU. It has been associated with longer ICU stay and worse clinical course; thus, imposing a heavy burden on the patient and the healthcare system. Furthermore, it can influence the management plan and curb invasive interventions [8].

Sudan is a middle lower-income country that is facing huge challenges in the healthcare system. It has been observed that thrombocytopenia is commonly encountered in the ICU setting. Searches of several electronic databases including PubMed, Google Scholar, and ResearchGate did not yield much data on the magnitude of ICU-acquired thrombocytopenia in Sudan. Thus, this could be the first study of its kind to shed light on thrombocytopenia in the critical care setting in Sudan.

The aim of the present study was to estimate the frequency of thrombocytopenia among patients admitted to the medical ICU of Omdurman Military Hospital (OMH) and the associated variables.

2. MATERIALS AND METHODS

2.1. Study Design

An observational, descriptive, hospital-based cross-sectional survey was conducted to calculate the prevalence of ICU-acquired thrombocytopenia and its associated risk factors. It was carried out in the medical ICU of OMH.

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2.2. Study Setting and Population

The medical ICU of OMH is a 35-bed service. Patients admitted to the ICU between January and April 2018 were considered for selection. All patients aged ≥ 18 years were included. Patients were excluded if they had: a platelet count $< 150,000/\text{mm}^3$ upon admission or if their platelet count dropped below that level < 5 days post-admission; history of platelet disorder; haematological malignancy; or splenectomy. The 5-day cut-off point reflected the platelets half-life.

2.3. Sample Size

One hundred and sixty patients admitted to the medical ICU of OMH between January and April 2018 were enrolled in the study. The participants were selected through systematic random sampling.

2.4. Data Collection

The data collection took place over a 4-month period, January–April 2018. The tool used for data collection was a checklist. No names or contact details were recorded.

The checklist was used to collect information on the age, gender, platelet count, admission diagnosis, presence of comorbidities, thromboprophylaxis use, antibiotics use, sedation, and mechanical ventilatory support.

2.5. Data Processing and Analysis

Statistical analysis of the collected data was carried out using SPSS version 21 (IBM, New York, NY, USA). Measures of central tendency and dispersion were used to analyse the numerical variables. The categorical variables were analysed using χ^2 -test. A p -value < 0.05 was used as a measure of statistical significance.

2.6. Ethical Statement

The research was carried out after approval of the Ethics Committee of the Sudan Medical Specialization Board and written permission from the administrative authority of OMH.

The guardians of patients who met the inclusion criteria were provided with a debrief and consent form that clearly stated the study title and purpose. The selection process was also explained. Participation in the research was completely voluntary and the right of withdrawal at any time without giving a reason was preserved. Patients who were conscious, oriented, and in a mental state enabling them to take decisions independently were provided with the consent form. No names were recorded. The study data were used for research purposes only.

3. RESULTS

3.1. Main Sample Characteristics

We enrolled 160 patients (57.5% male, 42.5% female) admitted to the medical ICU of OMH between January and April 2018.

The participants were selected through systematic random sampling with a response rate of 85.1%. The age of the study participants ranged between 24 and 88 years, with a mean of 55.42 and standard deviation of 16.46 years. Hypertension was the commonest comorbidity, followed by diabetes and chronic kidney disease with 26 (16.2%), 14 (8.8%), and eight (5%) cases, respectively. Thirty-two (20%) patients had more than one comorbid condition. The baseline characteristics of the sample population are summarised in [Table 1](#).

3.2. Prevalence of Thrombocytopenia

The mean platelet count upon admission was $237,600/\text{mm}^3$ and a standard deviation of $4,600/\text{mm}^3$. One hundred and twelve (70%) patients developed thrombocytopenia during their ICU stay. Among them, 68 (60.7%) were male and 44 (39.3%) were female. However, the gender difference was not significant. Half of the patients who developed thrombocytopenia were aged > 60 years. The frequency of thrombocytopenia is presented in [Table 2](#).

3.3. Associated Risk Factors

The occurrence of thrombocytopenia was directly linked to the use of thromboprophylaxis. Administration of thromboprophylaxis was guided by a local protocol that stratified patients into low, medium, and high risk for a thromboembolic event, and taking into consideration the risk of bleeding and other comorbidities. Out of 104 patients who were on thromboprophylaxis, 84 recorded a drop in platelet count $< 150,000/\text{mm}^3$ ($p = 0.002$). The use of antibiotics had a similar association: 86.2% of the patients who were on antibiotics developed thrombocytopenia ($p = 0.01$). Since antibiotic resistance is

Table 1 | Baseline characteristics of the sample population ($n = 160$)

| | Frequency, n (%) |
|---------------------------|--------------------|
| Gender | |
| Male | 92 (57.5) |
| Female | 68 (42.5) |
| Hypertension | 26 (16.2) |
| Diabetes | 14 (8.8) |
| Chronic kidney disease | 8 (5) |
| More than one comorbidity | 32 (20) |
| | Mean \pm SD |
| Age (years) | 55.42 \pm 16.46 |
| SOFA score | 4.6 \pm 2.1 |

SD, standard deviation; SOFA, Sequential Organ Failure Assessment.

Table 2 | Prevalence of thrombocytopenia

| | Thrombocytopenia frequency | | p |
|-------------|----------------------------|-------------|-------|
| | Yes, n (%) | No, n (%) | |
| Gender | | | |
| Male | 68 (60.7) | 24 (50) | 0.14 |
| Female | 44 (39.3) | 24 (50) | |
| Age (years) | | | |
| < 40 | 28 (25) | 24 (50) | 0.008 |
| 40–60 | 28 (25) | 8 (16.7) | |
| > 60 | 56 (50) | 16 (33.3) | |

Table 3 | Thrombocytopenia and the associated risk factors

| | All patients, n (%) | Developed thrombocytopenia, n (%) | No thrombocytopenia, n (%) | p |
|-------------------------------------|------------------------|--------------------------------------|-------------------------------|--------|
| Thromboprophylaxis | | | | |
| Yes | 104 (65) | 84 (52.5) | 20 (12.5) | 0.002 |
| No | 56 (35) | 32 (20) | 24 (15) | |
| Antibiotics | | | | |
| Yes | 116 (72.5) | 100 (62.5) | 16 (10) | 0.01 |
| No | 44 (27.5) | 30 (18.75) | 14 (8.75) | |
| Sedation and mechanical ventilation | | | | |
| Yes | 68 (42.5) | 56 (35) | 12 (7.5) | <0.001 |
| No | 92 (57.5) | 24 (15) | 68 (42.5) | |

a serious challenge in the critical care setting, an antibiotics stewardship programme was implemented. Administration of antibiotics was approved by a clinical microbiologist, based on culture and sensitivity results or empirically in highly suspected cases. The effect of mechanical ventilatory support and sedation followed a similar pattern.

The presence of comorbidities did not have a significant impact on the development of thrombocytopenia; neither did the admission diagnosis. The risk factors associated with the development of thrombocytopenia are summarised in Table 3.

4. DISCUSSION

The frequency of ICU-acquired thrombocytopenia varies widely. This can be attributed to the differences in the patient population, the definition used for thrombocytopenia, research methodology, and critical care setting, whether it is a surgical, medical or mixed ICU.

Although small in size and covering one hospital ICU, the present study revealed alarming figures in terms of the magnitude of the condition in Sudan. Seventy percent of the enrolled participants developed thrombocytopenia. Unfortunately, it is difficult to compare these numbers to those from the local context due to the paucity of literature about the subject. However, these results are higher when compared with those from the neighbouring states and the African region. In Egypt, it was estimated at 20% [6]. In Morocco, the incidence of thrombocytopenia among patients admitted to a surgical ICU was recorded at 36.6% [9]. In fact, the study results are higher than the global figures that range between 13% and 44% [10].

Age was directly correlated with the development of thrombocytopenia. Half of the patients who developed thrombocytopenia were above 60 years of age. The association was significant ($p = 0.008$). A similar finding has been reported by Strauss et al. [1]. In contrast, no significant association between thrombocytopenia and gender could be established.

There was a robust association between the drop in platelet count and the use of thromboprophylaxis, antibiotics, and mechanical ventilation. The risk of thrombocytopenia was higher in patients on thromboprophylaxis ($p = 0.001$). This observation was noted by Williamson et al. [11], who noticed that the risk was higher in patients on low molecular weight heparin thromboprophylaxis.

Antibiotic-induced thrombocytopenia has been discussed in the literature. Hanai et al. [12] found that 48.4% of patients on linezolid

developed thrombocytopenia [12]. Meropenem has also been linked with the platelet abnormality [13]. In this survey, 86.2% of patients receiving antibiotics developed thrombocytopenia ($p = 0.001$).

Intensive care unit admission indications and the presence of comorbidities did not differ significantly between patients with normal and low platelet counts. This is in line with the study of Faramawy et al. [6].

Our study had some limitations. First, selection bias could have occurred with systematic random sampling. Second, the classes or generic names of antibiotics were not recorded during data collection. Hence, no relation between thrombocytopenia and particular antibiotics could be identified. Third, the small sample size and short duration of the study were potential limitations.

Thrombocytopenia is one of the commonest haematological disorders in the ICU. Measuring platelet count is an easy and readily available procedure that makes it suitable to be used as a marker for patients admitted to the ICU. Our results showed an association between the development of thrombocytopenia and particular variables. The current study revealed a heavy burden of ICU-acquired thrombocytopenia in Sudan. In fact, the results were higher than the regional and global figures. However, they shed light on a major cause of morbidity and mortality in the ICU. More research needs to be conducted for in-depth investigation and to determine causation.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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