

## A Retrospective Study of Haematological Laboratory Parameter in Thrombocytopenia in Tertiary Care Hospital

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### Abstract:

**Introduction:** It is very important to identify the cause of Thrombocytopenia, where it is due to hyper destruction or hypo production of platelets as it will ultimately have an impact on the management of the patient. Mean platelet volume (MPV) and the platelet distribution width (PDW), can be used as screening test for the differentiating both types of thrombocytopenia and may help in avoiding or delaying the irrelevant invasive procedures like Bone-marrow aspiration (BMA). The detailed knowledge must be acquired from patients, who have been suffering from the Thrombocytopenia. The etiological differences are of importance in the assessment and management of Thrombocytopenia.

**Aim:** To study the association of Thrombocytopenia with different haematological parameters and its prevalence in different age groups. A study of 604 cases was conducted to evaluate the association of different haematological parameters with Thrombocytopenia, during a period from January 2020 to December 2022. Thrombocytopenia defined as low platelets, is attributed to variety of haematological and pathological disorders. During the evaluation of Thrombocytopenic patients, it is very important to identify the cause of Thrombocytopenia

**Material& Methods:** A complete hemogram and laboratory profile of a total case of 604 patients was carried out in each case of Thrombocytopenia. The EDTA samples were analysed after proper mixing in automated cell counter, Horiba, Tripad to obtain Complete Hemogram. Peripheral smear examination was done, stained with Leishman stain and examined under microscopy to confirm the platelet count and status of other blood cell lines [Red blood cells & White blood cells].

**Results:** Total 604 cases of Thrombocytopenia were studied from Jan.2020 to Dec.2022 in tertiary care hospital (RIMS), Govt. Medical College, Ongole, males:316 and females:288. Mild Thrombocytopenia-129, males:78 and females:51. Moderate Thrombocytopenia-199, males:113 and females:86. Severe Thrombocytopenia-276, males:125 and females:151. Thrombocytopenia with Anemia-284(47%), pancytopenia-124(20.5%), bicytopenia-169(27.98%), leucopenia-41(6.8%) and leucocytosis-50(8.3%) and isolated Thrombocytopenia-162(26.8%).

**Conclusion:** Thrombocytopenia is not a disease but is a diagnosis. Smear examination is very necessary in each case of Thrombocytopenia as it virtually rule out infectious cause, pseudo thrombocytopenia and leukemia and be able to triage life – threatening from serious cause. Detailed examination and the laboratory tests should be done, which are related to etiology.

**Keywords:** Thrombocytopenia, Haematological parameters, Pancytopenia, Bicytopenia Complete blood count, peripheral smear.

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### Introduction

Thrombocytopenia is defined as a decrease in the number of platelets in the peripheral blood. Thrombocytopenia is not a disease but is a diagnosis. The normal platelet count ranges between 150,000-450,000/microL. When the platelet count decreases below the lower reference range, it is called Thrombocytopenia and it may lead to petechial, purpura and ecchymosis. Platelets

can have a role both in primary and in secondary hemostasis. Platelets are essential for maintaining the integrity of the vascular endothelium and controlling haemorrhage from small-vessel injury through the formation of platelet plugs. [1]. When the platelet count falls below 20,000/ microL, it may lead to serious internal bleeding. There are three major pathophysiological mechanisms in

Thrombocytopenia, [1].reduced producing, [2]. Rapid demolishing and sequestration. Rapid demolishing is the reason for Thrombocytopenia, which is often seen. Demolishing of platelets depends on intra corpuscular or extra corpuscular reasons. The pathophysiology of Thrombocytopenia is based on 4 processes, namely artefactual Thrombocytopenia, deficient platelet production, accelerated platelet destruction and abnormal distribution or pooling of the platelets, within the body. Thrombocytopenia can also be seen in patients with severe iron deficiency anaemia, especially when haemoglobin level is <7gm/dl and MCV <60 ft.

Isolated Thrombocytopenia is defined as a low platelet count in the absence of abnormalities of RBC and WBC lineages and no signs or symptoms of systemic illness. Causes of isolated Thrombocytopenia include viral infections, immune-mediated platelet destruction, congenital diseases, gestational Thrombocytopenia, conditions in which splenomegaly is a prominent feature, antiphospholipid antibody syndrome, infectious diseases of bacterial origin and drugs.

The commonest cause is acute ITP, which is autoimmune or caused by infections eg-EBV/CMV or occasionally drugs (eg: quinine). Much rarer causes include thrombotic Thrombocytopenic purpura and the haemolytic uraemic syndrome (both associated with anaemia). Trombocytopenia is defined as platelet counts below 1,50,000 cells/mm<sup>3</sup>. But the knowledge of low platelet counts does not reveal the underlying cause of Thrombocytopenia. During evaluation of these patients with Thrombocytopenia, it is important to identify the aetiology of Thrombocytopenia, whether it is due to hypoproduction or hyper destruction of platelets, as this has an impact over the proper management of these patients.

The two main causes of Thrombocytopenia are:

1. Increased destruction or peripheral consumption (hyper destructive Thrombocytopenia).
2. Decreased platelet production (hypoproduative Thrombocytopenia).

Bone marrow aspiration remained the gold standard method for evaluating the cause for Thrombocytopenia for a long time, as it provides the information about the platelet production and number of megakaryocytes. But this procedure is invasive, time consuming and carries an overt risk of bleeding in some thrombocytopenic patients. Previously for the evaluation of Thrombocytopenia, platelet count by peripheral blood film was the only vital information available. But recently automated blood cell analysers have made it possible to measure various platelet indices such as platelet crit (PCT), platelet distribution width (PDW), mean

platelet volume (MPV) and platelet large cell ratio (P-LCR). Measurement of platelet indices in automated analysers has many advantages over the manual estimation as it is simple, quick and inexpensive test, which also eliminates the inter observer bias. Platelet indices could be used as markers for the interpretation of mechanisms of Thrombocytopenia in these patients. With such higher prevalence of Thrombocytopenia, characterization of Thrombocytopenia as per etiology and pathophysiologic mechanisms becomes important. Platelet indices are useful in the initial evaluation of patients with Thrombocytopenia by assessing their variation in different clinical scenarios and to assess their sensitivity and specificity [3].

The etiology of Thrombocytopenia varies widely ranging from transient marrow suppression to haematological malignancies. The most common causes of Thrombocytopenia are idiopathic (immune) thrombocytopenic purpura, leukemia, aplastic anemia, bone marrow infiltration, hypersplenism, disseminated lupus erythematosus, drugs and chemicals. The lesser common causes are infection including HIV, megaloblastic anemia, liver disease, alcoholism, massive blood transfusion, disseminated intravascular coagulation. The rare causes are thrombotic thrombocytopenic purpura, post-partum Thrombocytopenia, post-transfusion Thrombocytopenia, hemangiomas, food allergy and idiopathic cryoglobulinaemia.

Fever is the most challenging problem in the field of medicine, consists of occult manifestation of common diseases rather than the actual diseases. Thrombocytopenia is due to decreased production of platelets, increased destruction and increased sequestration in the spleen.

#### Material & Methods

The study was conducted in the department of pathology, GMC, Ongole. The study was approved by institutional ethics committee and informed written consents were obtained from subjects. The Study design was hospital based retrospective comparative study, A total of 604 subjects were included in study whose age ranged from 18–70 years. A complete hemogram and laboratory profile of total patients was carried out in each case of Trombocytopenia. The EDTA samples were analyzed after propermixing in automated cell counters HORIBA, Tripad to obtain complete hemogram. Peripheral smear was done, stained with Leishman stain and then microscopy was carried out to confirm the platelet count. The smears were also examined for important findings such as activated lymphocytes, blast cells, neutrophilic leucocytosis, schistocytes, target cells, band cells, nucleated red blood cells and platelet clumps. Platelets were counted by optical method.

**Inclusion Criteria:**

1. All patients with platelet count lower than 1,50,000/mm<sup>3</sup>
2. All patients with confirmed diagnosis of Thrombocytopenia by peripheral blood smear examination.
3. Patients with fever.

1. Patients on antiplatelet drugs and other medications causing Thrombocytopenia.
2. Diagnosed cases with secondary causes of ITP such as systemic lupus erythematosus.
3. Patients on treatment with antiplatelet drugs and other drugs cause Thrombocytopenia.

**Exclusion Criteria:****Results:****Table 1: Thrombocytopenia in different ages & sexes**

Age group in years	Male		Female		Total	
	Number	(%)	Number	(%)	Number	(%)
Neonate	7	3.6	8	3.95	15	2.5
1---10	24	8.4	16	4.95	40	6.6
11----20	38	13.1	56	21	94	15.4
21----30	50	16	62	19.4	112	18.7
31----40	38	11.5	38	12.5	76	12.4
41----50	43	12	35	14.2	78	12.7
51----60	45	12.9	42	12.6	87	14.4
61---70	52	15.3	20	7.4	72	11.9
71---80	18	6.5	10	3.65	28	4.6
81----90	1	0.5	1	0.4	2	0.33

From table 01 , it is evident that maximum number of cases was seen between age group of 21—30 years.(18.7%). Among males maximum number of patients was in 61—70 years of age group accounting for 16.45%. Among females maximum number of patients was 21—30 years of age group accounting for 21.5%.

**Table 2: Thrombocytopenia with type of Anaemia**

S. No.	Type of Anaemia	Number	Percentage (%)
1.	Normocytic Hypochromic	23	8.09
2.	Normocytic Normochromic	18	6.33
3.	Microcytic Hypochromic	200	70.42
4.	Dimorphic	40	14.08
5.	Macrocytic	2	0.7
6.	Microcytic	1	0.35
	Total	284	100

**Table 3: Thrombocytopenia with significant peripheral smear findings**

	Peripheral smear findings	Number of cases
A.	Abnormalities of R.B.C	
	Anisopoikilocytosis	60
	Nucleated R.B.C	23
	Target cells	12
	Polychromatophilic R.B.C	10
	Anisocytosis	9
	Stomatocytes	3
	Hemolyticanemia	2
	Schistocytes	2
	Sickle cells	2
	Spherocytes	1
B.	Abnormalities of W.B.C	
	Neutrophilia	44
	Lymphocytosis	20
	Acute leukemia	12
	Shift to left	8
	Toxic granules	6
	Appearance of blasts	2

	Chronic lymphocytic leukemia	2
	Leucoerythroblastic picture	2
	Eosinophilic leucocytosis	1
C.	<b>Platelet clumps</b>	66

## Discussion

The main purpose of this study is to find different haematology parameters in Thrombocytopenia. Isolated Thrombocytopenia was seen in 162. Bicytopenia study: Anemia with Thrombocytopenia was present in 169 & Leucopenia with Thrombocytopenia was observed in 41, out of 604 cases. Total number of patients with Thrombocytopenia—604. Based on the severity, Thrombocytopenia categorized in to Mild, Moderate, and Severe. Mild Thrombocytopenia (total number of cases: 129), male—78, female—51. Moderate Thrombocytopenia (total number of cases: 199), male—113, female—86. Severe Thrombocytopenia (total number of cases: 276), male—125, female—151. The present study shows—Pancytopenia—124, Bicytopenia—169, Isolated Thrombocytopenia—162, Acute leukemia—12, Chronic lymphocytic leukemia—2, Hemolytic anemia—2, Leukoerythroblastic reaction—2. Dr. Ruchit Patel study: Isolated Thrombocytopenia was seen in 78, out of 150 cases, Bicytopenia (Anemia with Thrombocytopenia) was present in 18 cases, out of 150. Leucopenia with Thrombocytopenia was observed in 23 cases, out of 150.

Maximum number of cases was seen in 31—40 years of age. Most common cause of Thrombocytopenia with leukocytosis was sepsis. (76%). Dr. Ekta Mittal study: Thrombocytopenia is seen in numerous conditions. With the advent of automated platelet indices like MPV, PDW and PCT, it has become easier for the clinician to identify the underlying cause of Thrombocytopenia. The frequency of consultation with haematologists for Thrombocytopenia cases continues to increase after the advent of automated analysers.

It was analysed that Thrombocytopenia due to hyperdestruction was mainly seen in the higher age group (i.e. 31—45 years to > 60 years), whereas cases due to hypoproduction was mainly seen in the lower age group (i.e. < 15 years to 31—45 years). The MPV (mean platelet volume) was significantly higher in hyperdestructive group, when compared with hypoproducer group. [3,4]. PDW (platelet distribution width) was significantly higher in the hyperdestructive group, when compared with hypoproducer group. [5]. Dr. Jaynisha D. Patel study: Thrombocytopenia in different ages & sexes, among males maximum number of patients were in 31—40 years of age group accounting for 24.37%. Among females

maximum number of patients was 21—30 years of age group accounted for 35.5%. The most common etiologies in this age group was malaria followed by viral fevers and non-viral, dengue fever. Female in the age group of 1—10 years were three times more commonly affected compared to males and males in age group of 11—20 were two times more affected than females. Females in the age group of 21—30 years were more affected due to gestational Thrombocytopenia. [6]. The etiology of Thrombocytopenia are diverse. The most common causes of Thrombocytopenia are idiopathic (immune) thrombocytopenic purpura, leukemia, aplastic anaemia, bone-marrow infiltration, hypersplenism, and disseminated lupus erythematosus. Microbiological causes were found in the majority of Thrombocytopenia case, malaria followed by viral fever, dengue. [6]. Thrombocytopenia is the most common haematological change in malaria. But immunological as well as non-immunological destruction of platelets have been implicated, but the mechanism involved is not completely clear. Immune mediated lysis, sequestration in the spleen and a dyspoietic process in the marrow with diminished platelet production have all been postulated in the cause for Thrombocytopenia. Dr. Shrivani N. et al study:

The most common non-malignant conditions causing Thrombocytopenia were megaloblastic anemia, post-infectious Thrombocytopenia, immune Thrombocytopenia and aplastic anemia. [7]. Dr. Aman M Naikwadi study: Mild, moderate and severe Thrombocytopenia observed in 47%, 35%, and 18% respectively. Out of 100 cases of fever with Thrombocytopenia, 62 were males and 38 were females. The maximum number of cases noted in the age group of 30—40 years (35%). The percentage of cases noted in the age group of 20—30 years, 40—50 years, 50—60 years and > 60 years are 27%, 18%, 12%, and 8% respectively [8]. During the hospital stay all the patients were subjected repeat CBC once in 2 days & follow up of all patients regarding treatment. Thrombocytopenia can be defined as a below normal number of platelets in the circulating blood. Often patients with Thrombocytopenia are asymptomatic and are diagnosed by routine complete blood count. Patients with Thrombocytopenia may experience bleeding manifestations, such as petechiae, epistaxis, gum bleeding, hematuria, gastrointestinal hemorrhage or intracranial bleeding. It is the most common cause of bleeding in children [9]. Mild

Thrombocytopenia, seen in pregnancy. Thrombocytopenia associated with hemolytic anemia, the underlying cause is one of the following –1). Thrombotic microangiopathy, hemolytic uremic syndrome (HUS), or thrombotic thrombocytopenic purpura (TTP). 2). Evans syndrome. 3). Disseminated Intravascular coagulation (DIC).

Thrombocytopenia associated with disturbances of both Red and White blood cell lines. A number of conditions can produce Thrombocytopenia along with disturbances in both Red and White blood cell lines( either Pancytopenia or Thrombocytopenia with anemia and leukocytosis, the latter often accompanied by abnormal White blood cells). These include 1). Myeloproliferative syndromes 2). Myelofibrosis & Myelophthisis. Aplastic anemia is characterized by Pancytopenia. Myelodysplasia can cause Pancytopenia or Thrombocytopenia with anaemia and leukocytosis.

### Conclusion

In our setup, smear examination is very necessary in each case of Thrombocytopenia as it virtually rule out infectious cause, pseudo thrombocytopenia and leukemia. Thrombocytopenia is not a disease but is a diagnosis. The detailed knowledge must be acquired from patients, who have been suffering from the Thrombocytopenia.

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