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Evaluation of thrombocytopenia: A single-center experience

Swati Patel[1,*], **Avantika Sinha**[1]

[1] *Dept. of Pathology, Medical College Baroda, Vadodara, Gujarat, India*

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ABSTRACT

Background: To evaluate the common etiologies and bleeding manifestations in patients of thrombocytopenia and its clinical presentation, methods of investigation, and impact of various modes of management.

Materials and Methods: Total 104 patients with platelet count less than l00,000 per cu.mm. with age, more than 12 years admitted to hospital between January 2010 to October 2011 were included in this study. Platelet count on automated cell counter less than 100,000 per cu.mm. and confirmed in peripheral smear were included in the study. All EDTA samples were processed in Abacus junior 5 hematology Analyser. Peripheral blood smear review was done for all cases. Clinical history and physical examination were collected from patients and medical record files.

Results: The present study included 56 male patients and 48 female patients. The most common bleeding manifestation was petechial rash 8.6%, hemoptysis and traumatic bleeding account for 1.9 % each, whereas 74% of patients did not present with any bleeding issues. Total 66 patients presented with symptoms of fever, 73 had signs of pallor, 22 patients had splenomegaly, 16 patients had hepatomegaly. Total 37.5% of patients were diagnosed with malaria and 1 patient (0.96%) was diagnosed with plasma cell leukemia. Chronic liver disease, megaloblastic anaemia, ITP (Idiopathic thrombocytopenia) and chronic renal failure account for 9.6%, 13.4%, 5.7% and 3.8% respectively. Total 16 patients had platelet counts less than 20000/cu.mm. and 37 patients had platelet count between 60000-80000/cu.mm. Malaria (39 patients) was the major cause of thrombocytopenia. Out of 39 patients with malaria 10 patients had P. Falciparum, 27 had P. Vivax and 2 patients had both.

Conclusion: Patients with a platelet count less than 100,000/cu.mm have very high chances of bleeding manifestation. Cutaneous bleed is the most common manifestation. Malaria can be present with signs of thrombocytopenia. Timely and accurate diagnosis is the key to the management of thrombocytopenia.

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1. Introduction

The past few decades have seen a literal explosion of interest in the structure, function, and patho-physiological role of the platelet. Major advances have been made in our understanding of platelet production, its differentiation from progenitor cells and megakaryocytes, and platelet immunology. The cell biology of platelet membrane receptor and granule constituents, like secreted proteins, have been extensively investigated and newer techniques of molecular biology have allowed the determination of the primary structure of many of the proteins involved.

In mammals, the major function of platelets in hemostasis, a process in which this cell plays both a valuable mechanical and biochemical role. Thrombocytopenia is the most common cause of abnormal bleeding manifesting as petechiae, purpura, ecchymosis, epistaxis, bleeding gums, hematemesis, haematuria, etc. Thrombocytopenia is

* *Corresponding author.*
E-mail address: swati3783@gmail.com (S. Patel).

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defined by clinical characteristics and patho-physiological mechanisms. The patient with thrombocytopenia often presents with diagnostic and management challenges simultaneously. The differential diagnosis is broad because, the disorders leading to thrombocytopenia are diverse, with failed production at one extreme and accelerated destruction at the other. Thrombocytopenia may be a benign, incidental finding in an asymptomatic patient or the sign of a potentially life-threatening disorder. The history, physical examination, and peripheral blood smear can assist the physician in determining the diagnosis and treatment. The history may reveal related illnesses, risk factors such as infection or drug use, or family history suggestive of congenital thrombocytopenia. The physical examination should concentrate on the lymphatic and hepatic and splenic systems, with the physician looking for jaundice, fever, or petechiae. With the review of a complete blood cell count and a peripheral smear examination, the initial work-up is completed and may prevent additional, unnecessary testing. Etiology-specific tests follow if needed. Serious spontaneous bleeding is usually a risk only in patients with platelet levels under 20,000 per mm3. More often, the smear is an important tool in the provision of differential diagnosis and an indication of further necessary tests. The blood smear can have an important role in the speedy diagnosis of certain specific infections. Otherwise, its major roles are in the differential diagnosis of anemia and thrombocytopenia and in the characterization of leukemia and lymphoma. [1]

The study is undertaken to study the common etiologies and bleeding manifestations in patients of thrombocytopenia, keeping in mind the diversity of this syndrome concerning its clinical presentation, etiological factors, methods of investigation, and impact of various modes of management.

2. Materials and Methods

Total 104 patients with platelet count less than l00,000 per cu. mm. admitted to Emergency Medicine Department of S.S.G. Hospital (Sir Sayajirao General Hospital) between January 2010 to October 2011 were included in this study. The details of their clinical history, examination, and results of laboratory investigations were noted. Patients of more than 12 years of age with platelet count on an automated cell counter less than 100,000 per cu. mm. and confirmed in peripheral smear were included in the study. All EDTA samples were processed in Abacus junior 5 hematology Analyser - a fully automated cell counter, based on impedance principle, for generating red cell indices, total count (TC), differential count (DC), and Platelet count. Peripheral blood smear review was done for all cases presenting with platelet count less than l00,000 per cu. mm. Thin peripheral smears were made from the EDTA bulb. They were air-dried and fixed with methanol and later stained by Leishman's stain. Each smear was examined in detail under a microscope for Red cell morphology, Estimation of white blood cell (WBC), platelet count, detailed study of platelet morphology, any other abnormal cells, and WBC differential count. A thick smear was prepared from all such samples and stained by Giemsa stain for detection of malarial parasites. Clinical history and physical examination were collected from patients and medical record files. Other investigations done were also noted during their course in the hospital.

3. Results

The present study included 104 patients with platelet count less than 100,000 per cu.mm. on admission to S.S.G. Hospital. There were 56 male patients and 48 female patients. The majority of patients (39.4%) were between 20 and 29 years of age. The most common bleeding manifestation was petechial rash 8.6%, hemoptysis and traumatic bleeding account for 1.9 % each, whereas 74% of patients did not present with any bleeding issues (Table 1).

Out of 104 patients 66 patients presented with symptoms of fever, 73 had signs of pallor, 22 patients had splenomegaly, 16 patients had hepatomegaly. On blood investigation, 7 patients (6.7%) had hemoglobin levels less than 3gm%. Total 31 patient's hemoglobin was between 3.1to 6 gm% and 32 patient's hemoglobin level was between 6.1 and 9 gm%. Total 34 patient's hemoglobin level was more than 9 gm%. Out of 104 patients, 20 had a WBC count less than 3000 cells/mm3 and 25 patient's WBC was more than 10000 cells/mm3. Fifty-nine patient's WBC count was between 3001 and 10000 cells/mm3.

Out of 104 majorities of patients (37.5%) were diagnosed with malaria and only 1 patient (0.96%) was diagnosed with plasma cell leukemia. Chronic liver disease, megaloblastic anaemia, ITP (Idiopathic thrombocytopenia) and chronic renal failure account for 9.6%, 13.4%, 5.7% and 3.8% respectively (Table 2).

Total 16 patients had platelet counts less than 20000/cu.mm. and 37 patients had platelet count between 60000-80000/cu.mm. (Table 3). Malaria (39 patients) was the major cause of thrombocytopenia. Out of 39 patients of malaria 10 patients had P. Falciparum, 27 had P. Vivax and 2 patients had both.

4. Discussion

The normal hemostatic mechanism maintaining blood in, a fluid state and controlling physiological blood loss as well as preventing abnormal bleeding in the body by many mechanisms like primary hemostatic plug formation which involves vessel wall, adherence, and aggregation of platelets at the site of injury in presence of von-Willebrand factor, activation of coagulation cascade leading to fibrin clot sealing the injured site, keeping a balance between formation of fibrin clot and control of fibrinolysis to restore

Table 1: Common bleeding manifestations in patients of thrombocytopenia.

S. No.	Bleeding Manifestation	Total	Percentage
1	Cutaneous Bleeding / Petechial Rash	9	8.6
2	Melena	5	4.8
3	Hematemesis	5	4.8
4	Bleeding Gums	2	1.9
5	Bleeding per vagina	7	6.7
6	Epistaxis	3	2.8
7	Haematuria	5	4.8
8	Haemoptysis	2	1.9
9	Intracranial bleed	0	0
10	Surgical /Traumatic Bleeding	2	1.9
11	No Bleeding	77	74

Table 2: Diagnosis in patients of thrombocytopenia

S. No.	Diagnosis	No. of Patients	%
1	ITP	6	5.7
2	HIV	3	2.8
3	CML/AML	3	2.8
4	Pregnancy	2	1.9
5	Chronic liver disease	10	9.6
6	Malaria	39	37.5
7	Apastic Anaemia	3	2.8
8	Megaloblastic Anaemia	14	13.4
9	DIC	3	2.8
10	Dengue / Viral Fever	6	5.7
11	Drug Induced	2"	1.9
12	Chronic renal failure	4	3.8
13	Snake Bite	2	1.9
14	Sickle	3	2.8
15	Sepsis	3	2.9
16	Plasma Cell Leukemia	1	0.96
	Total	104	

(ITP= Immune Thrombocytopenic Purpura, DIC=Disseminated Intravascular Coagulation, HIV= Human Immunodeficiency Virus, AML= Acute Myeloid Leukemia, CML= Chronic Myeloid Leukemia).

the patency of the vessel. Spontaneous bleeding or bleeding with trivial injury may occur if there is any defect in the above-mentioned hemostatic mechanism. A platelet-related disorder like thrombocytopenia, platelet functional disorders & thrombocythemia are important causes of bleeding manifestation presented by patients with a variety of identifiable and idiopathic diseases. Hence, it was selected as the subject for analysis in the present study.

In the present study majority number of the patients were between the age group of 20 to 29 years of total patients (39.4%). The average age in our study was 30.6 years. In the present study, the males predominated over the females with a ratio of 1.16: 1. Diseases like I.T.P, S.L.E may show a female predilection, whereas alcoholism, cirrhosis may show male predominance. There is no specific sex preponderance with H.I.V, drug-induced problems, or D.I.C.

Lohitashwa SB et al[2] in their study of thrombocytopenia found that 49% of patients who had a platelet count less than 150,000/cu.mm. had bleeding manifestation. Amongst it, petechiae were most common; seen in 63% of patients followed by hematuria and epistaxis. Magboolalam et al[3] reported that epistaxis is the most common bleeding manifestation in their study whereas Mohammad Ali et al[4] reported petechiae to be the most common in his observational study, followed by ecchymosis, epistaxis, gum bleeding, haematuria, melena and bleeding per vagina in decreasing frequency. Siddermaiah et al found cutaneous bleeding to be most common during their study.

In the present study, amongst all bleeding manifestations, cutaneous bleeding either petechiae or ecchymosis was the most common presenting symptom in 8.7% of patients. Other manifestations included per vaginal bleeding in 6.8% haematuria, melena, and hematemesis in 4.8%, epistaxis in 2.9%, bleeding gums, hemoptysis, and post-traumatic bleeding in 1.9% of patients each. An interesting observation was that as many as 74% of patients did not have bleeding manifestations despite a low platelet count.

Table 3: Relationship of diagnosis with platelet count

Diagnosis	<20000	20000 to 40000	40000 to 60000	60000 to 80000	80000 to l lakh	Total
ITP	5	1	0	0	0	6
HIV	1	0	0	1	1	3
CML/AML	1	1	0	1	0	3
Pregnancy	0	1	0	1	0	2
Liver	1	1	4	3	1	10
Malaria	0	5	10	17	7	39
Apastic Anemia	3	0	0	0	0	3
Megaloblastic Anemia	4	2	3	4	1	14
DIC	0	2	0	1	0	3
Dengue/ Viral fever	1	2	0	1	2	6
Drug Induced	0	1	0	1	0	2
ARF/CRF	0	1	0	0	2	3
Snake Bite	0	0	0	2	0	2
Sickle	0	0	0	3	0	3
Sepsis	0	1	1	2	0	4
Plasma Cell Leukemia	0	0	0	0	1	1
Total	16	18	18	37	15	

(ITP= Immune Thrombocytopenic Purpura, ARF=Acute Renal Failure, CRF=Chronic Renal Failure, DIC=Disseminated Intravascular Coagulation, HIV= Human Immunodeficiency Virus, AML= Acute Myeloid Leukemia, CML= Chronic Myeloid Leukemia)

Failure of hemostatic mechanism can lead to a variety of bleeding manifestations as ranging from mild petechiae and nose bleed to life-threatening intracranial hemorrhages. The type of bleeding manifestations depends on underlying hemostatic abnormalities. Moreover, coagulation defects result in haemarthrosis, spontaneous retroperitoneal bleeding, and deep hematomas. The bleeding usually occurs after some delay of sustaining injury. Petechiae or ecchymosis in skin generally does not occur in patients with functional disorders of platelet alone. In our study, cutaneous bleeding as expected in thrombocytopenic patients was the most frequent presenting problem. The most common etiology included I.T.P.

Hematemesis and melena usually occur when there is underlying chronic liver disease and/or associated coagulation defect as is observed in 5 of our patients with chronic liver disease. When hematemesis and/or melena occur in thrombocytopenic patients, the platelet count usually is very low as exemplified by 2 patients with viral fever, one patient of aplastic anemia, and sepsis each. Thus, Gastrointestinal bleeding in our study usually reflected underlying liver disorder.

So it is apparent that mucocutaneous bleeding is the most frequent manifestation of thrombocytopenic patients. Whenever there is a gastrointestinal bleed usually the initial platelet count is very low as in immune thrombocytopenia, aplastic anemia or there is an underlying cause especially chronic liver disease responsible for it.

Majority of the cases (63.4%) presented with fever followed by generalized weakness (32.3%), vomiting and bleeding manifestation (26%) each, chills and rigor in (20.1%), and dyspnoea in (12.5%). Physical signs included splenomegaly and pedal edema in 21.1% of patients, icterus in (17.3%), hepatomegaly in (15.3%). This was probably related to secondary thrombocytopenia, forming a major group in our study. Ascites were found in 5.7% of patients, which was attributable to chronic liver disorder, petechiae /ecchymosis was observed in 5.7% of patients. Surprisingly, a very high prevalence of pallor was observed in our study (70%).

Clinical examination forms an important part of thrombocytopenia. The type of bleeding not only gives clues about the underlying hemostatic aberration but also gives an idea about the quantity of blood loss. As mentioned earlier, petechiae and ecchymosis is an important indicator of the vessel wall or platelet defect as a cause of bleeding. Pallor reflecting underlying anemic state is not a feature of I T P. In our study, 5 out of 6 patients of I.T.P. showed mild to moderate pallor and all of them had some ongoing or recent bleeding episode. A severe degree of pallor would indicate a hematological condition like aplastic anemia, megaloblastic anemia, or hematological malignancy. Total 67% of patients had anemia (Hb <9 gm%). A very high prevalence of moderate to severe anemia was observed in our study. Twenty of our patients had abnormally low W.B.C. count (< 3000 cu.mm.) and most of them had aplastic anemia or megaloblastic anemia. Total 56.7% of patients had normal W.B.C. count. Abnormally high W.B.C. count (more than 10,000/ cu.mm) was seen in 25 of our patients. Out of them, 3 had a very high count suggestive of hematological malignancy.

Judicious use of the laboratory is mandatory in approaching any bleeding abnormality. The basic goal is to identify hemostatic abnormality and then find out the

underlying disease responsible for it. The screening test must include a complete blood count by cell counter and microscopy of thin and thick smear. The importance of W.B.C. count is in identifying disorders like bone marrow failure or infiltration and hematological malignancies like leukemia bags consideration.

In the present study, a good microscopic examination of peripheral smear was not substituted by any of the laboratory tests in conditions associated with thrombocytopenia. Though we did not have a single patient with congenital platelet disorder, its presence is mainly picked up by microscopy with abnormal morphology of platelets. Red cell parameters like M.C.V., M.C.H. are important indicators in identifying the type of anemia. Total 49 patients had microcytosis and 54 had hypochromia, combine would suggest an underlying iron deficiency state. This would be more an indicator of iron malnutrition. On the contrary, iron deficiency anemia can produce a high platelet count. 19 thrombocytopenic patients had normocytic R.B.C. with or without anemia. Normocytic anemia and thrombocytopenia can occur in disorders like S.L.E., H.I.V., lymphoma, leukemia. With the advent of electronic cell counters, megaloblastic anemia has been increasingly identified. Megaloblastic anemia is an important disorder responsible for thrombocytopenia. 36 patients had macrocytic anemia with — having macro-ovalocytes in peripheral smear. A close look at the quantitative and qualitative abnormalities of W.B.C. can give further clues to the underlying disorder.

A thick smear is a must in all thrombocytopenic febrile patients, especially in a peak malaria transmission season. It is observed in both types of malaria i.e. vivax and falciparum and therefore not a distinguishing feature between the two types. Most of the time, thrombocytopenia is not accompanied by bleeding manifestation. However, it is a good indicator of the malarial cause of fever.

Total 15.3% of patients in the present study had a platelet count of less than 20,000. Amongst the group of patients having Platelet count less than 20,000, 6(37.5%) had cutaneous bleeding which was the most common manifestation whereas 2(12.5%) had hematemesis, 3(18.7%) had haematuria and an equal number had epistaxis. Bleeding gums were found in 2(12.5%) patients of this group, per-vaginal bleed in 5(31.2%). Haemoptysis, post-traumatic bleed, and melena was found in l(6.2%) patient of this group.

Total 17.3% of patients had a platelet count of values between 20,000-40000. Amongst this group, 2(11.1%) had a cutaneous bleed and 1(5.5%) patient had hematemesis, melena, bleeding per vaginal and hemoptysis. Total 17.3% of patients had platelet count of values between 40,000 - 60,000. In these, 3(16.6%) had melena, 1(5.5%) had haematuria. Only 7 out of 37 patients having platelet counts between 60,000 to 80,000 had bleeding manifestations. 2 of this group (28.5%) had hematemesis and equal had haematuria. Cutaneous bleeding, post-traumatic bleeding, and bleeding per vaginal were found in 1 patient each (14.2%).

None of the patients with a platelet count greater than 80,000/cu.mm had any sort of bleeding. This observation suggests that lower the platelet counts more the chances of developing spontaneous mucocutaneous bleeding and as the platelet count increases the number of patients exhibiting bleeding manifestation decrease. Bleeding in thrombocytopenic patients can however be modified by age, chronicity, and type of disorders, the status of vessel wall, and presence of metabolic abnormalities like uremia and jaundice.

In Veenhoven et al study 39% of his patients had I.T.P. Similar results were found by Mohammad Ali et al.[4] Helsinki et al[5] supported the study of Veenhoven stating that I.T.P. was the most common cause of thrombocytopenia presenting with severe bleeding episodes. Magboolalam et al,[3] Siddermaiah et al, and Lohitashwa SB et al[2] both from India reported malaria as the most common disease-causing thrombocytopenia. These studies are comparable with the present study and may owe to the differences in the prevalence of different diseases in different geographic places and population variability.

George et al[6] reported drug-induced thrombocytopenia as the most common etiology while Venneri D et al proposed septicemia as the most common cause of thrombocytopenia. However, both these studies were conducted in intensive care units. In the present study, the largest groups studied were patients with malaria 37.5%. The second major group was due to patients with megaloblastic anemia (13.4%), liver diseases constituted 9.6% of total patients. ITP and viral fever were seen in 5.7% of patients.

In the present study total of 15.3% of patients had a platelet count of less than 20,000/cu.mm. Total 5 out of 6 patients of ITP belonged to this group and constituted 31.25% (5 out of 16) of patients with severe thrombocytopenia. All (3 out of 3) patients of aplastic anemia and 4 out of 14 patients of megaloblastic anemia belonged to this group contributing (18.7%) and (25%) respectively to this group. 17.3% of patients had platelet count between 20,000 - 40,000, in which malaria dominated making 27.7% of this group (5 out of 18 patients). Total 67.4% of our patients had a platelet count of more than 40,000. This level of platelet count is important because it is believed that chances of spontaneous bleeding because of low platelet count are high if the platelet count is less than 30,000.

The majority of patients with liver diseases, HIV, malaria, snake bite, megaloblastic anemia had platelet count exceeding 40,000. Malaria had a wide variety of platelet counts.

Slejifer et al in his study reported that patients who presented with severe thrombocytopenia had an acute I.T.P. which is comparable to our study. A variety of diseases can lower platelet count by different mechanisms. The absolute number does not give an idea about the nature of platelet reduction or etiological factors. However, it was observed in the present study that if platelet counts are severely lowered, then the possibilities are I.T.P, megaloblastic anemia, viral fever, or aplastic anemia. D.I.C., H.I.V., S.L.E., chronic liver disease, pregnancy, and drug induced can reduce the platelet count between 40,000 -1,00,000. This was the reason why a majority of patients belonging to the latter group had lesser bleeding manifestation.

The lowest average platelet count (10,333) was seen with patients of ITP. Other diseases in descending order of average platelet counts are Aplastic anemia (11,400), DIC (38,000), drug-induced thrombocytopenias (41,500), hematological malignancy (41,666), megaloblastic anemia (42,928), and viral fever (48,500). Rest all diseases had an average count of more than 50,000 at the time of admission in our study. The mean platelet count reported by Lalitha TB et al[7] was 83,000 in their case of malaria, while Jadhav et al[8] reported a mean platelet count of 1,09,000. The mean platelet count obtained in the present study was 63,205.

Thrombocytopenia is almost invariable in malaria and so may be helpful as a sensitive but nonspecific marker. Thrombocytopenia should increase the suspicion of malaria, and multiple peripheral smears or a more sensitive test-like ELISA- for detection of parasite-specific antigen levels should be performed.[9] Thrombocytopenia has been reported to be associated with malaria, with incidence ranging from 40.5-85%[10,11] with some studies reporting a lower incidence in vivax malaria as compared to falciparum malaria.

Out of a total of 39 patients with malaria 27 (69.2%) had P.vivax malaria and 10 (25.6%) had P.falciparum malaria while 2 (5.1%) had mixed infection. Erhart. et al[12] and Jadhav et al[8] and Muddaiah et al studies have reported a higher frequency of P.vivax malaria ranging from 53% to 62% of the total cases studied. In the present study, the frequency of P.vivax was 69.2% similar to that obtained by the above-mentioned studies. Plasmodium falciparum and Plasmodium vivax are endemic infections in India and are associated with mild hematological abnormalities. Severe thrombocytopenia is common in isolated falciparum and mixed falciparum/vivax malaria, but it is very rare in isolated P.vivax infection. In the present study 7.4% of cases of P.vivax malaria had platelet count <40,000/cu.mm. whereas a study was done by Myong-don, et al[13] in South Korea in 1996-1999 on 101 patients of P.vivax had only 5% fall in this group. Lower platelet counts secondary to isolated P.vivax malaria appear to be commoner in the Indian study.

It is however to be noted that none had a platelet count less than 20,000/cu.mm. In Horstsmann's series[14] the lowest count in 39 cases of vivax malaria was 44x109/l. Profound thrombocytopenia secondary to isolated vivax malaria have been reported from India, one with initial platelet count 5xl09/l[15] and another 8x109/1,[16] these being the first and second cases of profound thrombocytopenia secondary to vivax infection reported in the literature. Total 70.3% of cases of vivax fell into the 40x109/l to 80x109/l category. Thrombocytopenia secondary to isolated vivax infection probably tends to be more severe in India.

Fever-associated thrombocytopenia accounted for 66 of these cases. There were 37 males (56%) and 29 females (44%) in this group. In a study done by Nair PS et al 109 patients with fever-associated thrombocytopenia were studied had 69.7% of male patients and 30.3% of females patients. There was no patient in the below 5000/cu.mm. platelet count group in the present study. The percentage of patients between 50,000 to 1,00,000 platelet count were however similar being 60.6% in the present study and 56.8% in the study mentioned above. The commonest bleeding manifestation secondary to fever-associated thrombocytopenia was gastrointestinal bleed, which was seen in 9.1% of cases. The frequency of bleeding manifestation in fever-associated thrombocytopenia was less in the present study compared to the Nair PS et al[17] study. Total 31.9% of those with fever-associated thrombocytopenia had bleeding manifestation in the present study whereas 41.3% had bleeding manifestation in Nair PS et al[17] study. Petechial rash and gastro-intestinal bleed were the most common bleeding manifestation in the Nair PS et al[17] study (9.2% each). Gastrointestinal bleed was the most frequent bleeding manifestation in this study (9.1%) followed by petechial rash and hematuria each 6.1%. This difference in bleeding manifestations may be attributed to the etiology, as a viral fever associated with lower mean platelet count was the most common etiology in the above-mentioned study while malaria was the most common cause in our study with a higher mean platelet count. Thrombocytopenia is rarely accompanied by clinical bleeding or biochemical evidence of DIC. Clinical bleeding in severe malaria is not a common feature and occurs in less than 5-10% of individuals with severe disease.[8]

5. Conclusion

Thrombocytopenia is creating many challenges in patients' management with underlying pathology. Timely diagnosis is the key to the management of these patients. Patients with a platelet count less than 100,000 / cu.mm have very high chances of bleeding manifestation. The present study shows bleeding manifestation in 26% of the study population with platelet count less than 40,000/cu.mm., and was less observed in patients with platelet count >80,000/cu.mm. Cutaneous bleeding was the most common presentation

followed by, bleeding per vagina and hematuria. Malaria with 37.5% of the total number of cases was the commonest cause of thrombocytopenia. Megaloblastic anemia with 13.4% of the total number of cases was next common followed by liver disease (9.6%), viral fever, and ITP(5.7%) each. Plasmodium vivax was solely the cause for thrombocytopenia in 69.2% of patients with malaria and Plasmodium falciparum accounted for 25.6% of the malaria cases. Severe thrombocytopenia platelet count (<20,000/cu.mm.) was observed in patients with ITP, aplastic anemia, and megaloblastic anemia.

6. Conflict of Interest

There is no potential conflict of interests related to the exclusive nature of this paper.

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Author biography

Swati Patel, Associate Professor https://orcid.org/0000-0002-4127-0176

Avantika Sinha, Private Practitioner

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