

# A Prospective Study of Impedance Platelet Count and Mean Platelet Volume in Case of Severe Microcytosis

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## Abstract

**Introduction:** Microcytosis is a condition in which red blood cells are measured by their mean corpuscular volume <sup>2</sup>. Microcytosis is characteristics of Iron deficiency anemia.<sup>1</sup> Both Thrombocytosis and thrombocytopenia may be seen in severe microcytosis although thrombocytosis is more commonly seen.

**Aim and Objectives:** To study the values of impedance platelet count and mean platelet volume in case of severe microcytosis.

**Materials and Method:** A prospective study of 150 cases was carried out from 1<sup>st</sup> July 2019 to 31<sup>st</sup> October 2019 in Department of Pathology, B.J. Medical college, Ahmedabad. Study of platelet count and mean platelet volume of 150 cases with low mean corpuscular volume (MCV) was done.

**Results:** A total 150 cases with severe microcytosis (MCV < 60 fl) were evaluated for platelet count and mean platelet volume. Thrombocytosis was seen in 85 cases(56.7%), thrombocytopenia in 15 cases(10%), whereas normal platelet count was seen in 50 cases(33.3%). The mean platelet volume was low in 75 cases(50%) , high in 10 cases(6.7%), normal in 65 cases(43.3).

**Conclusion:** In severe microcytosis, both thrombocytosis and thrombocytopenia may occur although the incidence of thrombocytosis was high in our study. There is an inverse relationship of mean platelet volume and platelet count in case of severe microcytosis.

**Keywords:** *Microcytosis, Mean corpuscular volume, Mean platelet volume, Thrombocytosis, Thrombocytopenia.*

## Introduction

Microcytosis is a condition in which red blood cells are measured by their mean corpuscular volume.<sup>2</sup> Normal MCV is 80 - 99 fl.

The most common cause of microcytosis is iron deficiency.<sup>3</sup> The presence of microcytes usually results from a defect in haemoglobin formation. Microcytosis is

characteristics of iron deficiency anemia, thalassaemia, and severe case of anemia of chronic disease. Causes that are rare includes congenital and acquired sideroblastic anemias.<sup>1</sup> Iron deficiency is due to a defect in hemoglobin synthesis that results in microcytic red blood cells and decreased amount of hemoglobin. In addition to changes in RBC indices iron deficiency anemia is also known to cause mild to moderate thrombocytosis.<sup>4</sup> Thrombocytopenia can also be seen in patients with severe iron deficiency anemia especially when hemoglobin level is < 7g/dl and MCV <60 fl.<sup>5,6</sup>

In some studies Mean platelet volume(MPV) has been suggested as a useful platelet index for platelet volume. It correlates directly with megakaryocyte DNA content and megakaryocytic ploidy is reduced in reactive thrombocytosis.<sup>7</sup> Mean platelet volume is comparable to

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the mean corpuscular volume(MCV) of red blood cells.<sup>8</sup> volume(MCV) was done.

**Aim and Objectives**

To study the values of impedance platelet count and mean platelet volume in case of severe microcytosis.

**Materials and Method**

A prospective study of 150 cases was carried out in Department of Pathology. B.J. Medical College, Ahmedabad.

Estimation of platelet count and mean platelet volume(MPV) of 150 cases with low mean corpuscular

The samples were collected under sterile conditions in EDTA(ethylene diamine tetraacitic acid) tubes and analyzed using automated cell counter Horriba Penta XLR.

**Results**

A total of 150 cases with severe microcytosis (MCV < 60 fl) were evaluated for platelet count and mean platelet volume. The results are summarized in Table 1.

**Table 1: Comparison between platelet count and mean platelet volume in cases with severe microcytosis.**

Platelet count	Range	No. of cases n=150	Mean platelet volume Normal 7-11 fl Low <7 fl High > 11 fl
Normal	1.5 - 4 lac/cumm	50 (33.3%)	50 (33.3%) Normal
Mild thrombocytosis	4.5 - 7 lac/cumm	55 (36.7%)	15 (10%) - Normal 40 (26.7%) - Low
Moderate thrombocytosis	7 - 9 lac/cumm	20 (13.3%)	20 (13.3) - Low
Severe thrombocytosis	9 - 10 lac/cumm	7 (4.7%)	7 (4.7%) - Low
Extreme thrombocytosis	>10 lac/cumm	3 (2%)	3 (2%) - Low
Thrombocytopenias	<1.5 lac/cumm	15 (10%)	10 (6.7%) - High 5 (3.3%) - Low

50 cases (33.3%) had platelet counts within normal limit.

85 cases (56.7%) had thrombocytosis. Cases of thrombocytosis were divided into four grades - mild, moderate, severe and extreme.<sup>9</sup>

55 cases (36.7%) had mild thrombocytosis. Out of these 55 cases, 15 (10%) had normal mean platelet volume and 40 (26.7%) had low mean platelet volume.

20 cases (13.3%) had moderate thrombocytosis. 7 cases (4.7%) had severe thrombocytosis, 3 cases (2%)

had extreme thrombocytosis. Mean platelet volume was low in all of them.

15 cases (10%) had platelet count of less than 1.5 lac/cumm. 10 (6.7%) cases out of these had high mean platelet volume and 5 (3.3%) cases had low mean platelet volume.

The results of mean platelet volume are summarized in Table 2.

**Table 2: Distribution of cases according to different range of mean platelet volume.**

Mean platelet volume	Range(7-11fl)	No. of cases(n=150)
Normal	7 - 11 fl	65 (43.3%)
Low	< 7 fl	75 (50%)
High	> 11 fl	10 (6.7%)

**Table 3: Platelet count in cases with normal mean platelet volume.**

Mean platelet volume Normal (7-11fl)		No. of cases 65 (43.3%)
Platelet count	Normal	50 (33.3%)
	Mild thrombocytosis	15 (10%)

65 cases (43.3%) had normal platelet volume. Among these ,50 cases (33.3%) had normal count and 15 cases (10%) had mild thrombocytosis.(Table 3.)

**Table 4: Platelet count in cases with low mean platelet volume.**

Mean platelet volume Low (<7fl)		No. of cases 75 (50%)
Platelet count	Thrombocytosis (4.5-10 lac/cumm)	70 (46.7%)
	Thrombocytopenia (<1.5 lac/cumm)	5(3.3%)

75 cases (50%) had mean platelet volume less than 7 fl. Among these 75 cases, 70 cases (46.7%) had platelet count between 4.5 - 10 lac/cumm. 5 cases (3.3%) had platelet count of less than 1.5 lac/cumm. These cases were further evaluated. (Table 4.)

**Table 5: Mean platelet volume in cases of thrombocytopenia.**

Thrombocytopenia Platelet count <1.5 lac/cumm		No. of cases 15 (10%)
Mean platelet volume	High (>11 fl)	10 (6.7%)
	Low (<7 fl)	5 (3.3%)

Thrombocytopenia was seen in 15 cases (10%). Out of these 10 (6.7%) cases had mean platelet volume >11 fl and other 5 (3.3%) cases had mean platelet volume <7fl. (Table 5.)

## Discussion

The results of the present study showed that platelet counts were increased in majority of the patients i.e. 85 (56.7%) cases with severe microcytosis.

The mean platelet volume was low in 70 (46.7%) cases out of 85 cases of thrombocytosis. In 15(10%) cases of thrombocytosis, the mean platelet volume was normal. An inverse relation was found between platelet volume and platelet count in cases of severe microcytosis.

The MPV is very dependant on the technique of measurement and on the length and conditions of storage before the blood is tested. When MPV is measured by impedane technology, it has been found to vary inversely with the platelet count in normal subjects.<sup>1</sup> In reactive thrombocytosis, mean platelet volume and platelet count vary inversely.<sup>10</sup> Mean platelet volume (MPV) is directly proportional to the DNA content of megakaryocyte. In reactive thrombocytosis, megakaryocyte ploidy is reduced. Thus, reduced mean platelet volume in reactive thrombocytosis reflects an alteration in megakaryocytopoiesis, more megakaryocytes less endoreduplication, less DNA content and low mean platelet volume.<sup>11</sup>

In study done by Sun Y.C and John J.Y.<sup>11</sup> results similar to our study were seen. They also found low mean platelet volume and thrombocytosis in cases of microcytosis due to iron deficiency anemia. Suleyman Y and Medine C C. et.al<sup>12</sup> in their study found that mean platelet volume was low in cases of thrombocytosis due to iron deficiency anemia.

Shah A R and Chaudhari S N<sup>8</sup> also found an inverse relationship between platelet volume and platelet counts in cases of anemia.

Incidence of thrombocytopenia was seen in 15(10%) cases which were slightly more than in other studies. Beguin Y<sup>13</sup> in his study found that thrombocytopenia associated with severe microcytosis could be related to high erythropoietin level in such patients.

In present study the platelet counts were normal in 50 (33.3%) cases with normal mean platelet volume.

## Conclusion

1. Both thrombocytosis and thrombocytopenia may occur in severe microcytosis although the incidence

of thrombocytosis is higher in our study as compared to thrombocytopenia.

2. There is an inverse relationship of mean platelet volume and platelet count in severe microcytosis.

**Ethical Clearance:** All procedures performed were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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