"ROLE OF IMMATURE PLATELET FRACTION IN THE EVALUATION OF PATIENTS HAVING THROMBOCYTOPENIA"

By

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Dissertation submitted to the

BLDE (Deemed to be University), Vijayapura, Karnataka

In partial fulfillment of the requirements for the award of the degree of

DOCTOR OF MEDICINE

IN

PATHOLOGY

Under the Guidance of

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ACKNOWLEDGEMENT

First and foremost, praises and thanks to the God, the Almighty, for showering his blessings throughout the process of my work and to complete it successfully.

I would like to express my deep and sincere gratitude, to my guide and my mentor **Dr. SUREKHA B. HIPPARGI MD**, PROFESSOR, Department of Pathology who gave me an opportunity to do my dissertation and providing me with her invaluable guidance while conducting this study. Her dynamism and motivation has always inspired me.

I would like to thank **DR. SUREKHA U. ARAKERI MD**, who has supported equally to accomplish this dissertation and would like to thank all Professors and Assistant Professors of the Department of Pathology, Dr. B.R. Yelikar Former- Professor and H.O.D, Department of Pathology Prof, Dr. R.M. Potekar Prof, Dr. Mahesh H. Karigoudar Prof, Dr. Satish Arakeri Assis. Prof, Dr. Vijayalaxmi S. Patil Assoc. Prof, Dr. Mamatha K. Assoc. Prof, Dr. Sai Kulkarni Assis. Prof, Dr. Prakash M. Patil Assoc. Prof, Dr. Savitri M. Nerune Assoc. Prof and Dr. Sneha Jawalkar Assis. Prof for their immense support and encouragement.

I thank all the technical staff of Department of Pathology, for their sincere assistance and contribution to my study. I also express my sincere thanks to Dr Vijaya Sorganvi for sharing her expertise at statistics and making it seem uncomplicated.

I am extremely grateful to my parents **Dr. Gopal Chandra Dey** and **Dr. Chandana Dey** who have helped me in every possible way and without their blessings and moral support this dissertation would not have been possible. Also, would like to thank my elder sister **Dr. Jolly Dey** who has been a constant source of inspiration and encouragement during my study. My heartfelt thanks to **Mr. Manish Gupta** for his invaluable support and motivation.

A sincere thanks to all my seniors especially Dr. Rama Devi, Dr. Moksha, Dr. Afra Taqdees and Dr. Chaitra T, and my batchmates especially Dr. Toshi Agarwal, and my juniors who have helped me to accomplish my dissertation.

Last but not the least my heartfelt thanks to all the patients who formed this study group and co-operated whole heartedly.

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LIST OF ABBREVIATIONS

CBC	Complete Blood Count
MCH	Mean Corpuscular Hemoglobin
MCHC	Mean Corpuscular Hemoglobin Concentration
IPF	Immature Platelet Fraction
RP	Reticulated Platelets
DIC	Disseminated Intravascular Coagulation
EDTA	Ethylenediamine tetra acetic acid
MPV	Mean Platelet Volume
PCT	Plateletcrit
PDW	Platelet Distribution Width
P-LCR	Platelet Large Cell Ratio
DNA	Deoxyribonucleic acid
RNA	Ribonucleic acid
RBC	Red Blood Cells
WBC	White Blood Cells
Hb	Haemoglobin
nRBC	Nucleated Red Blood Cells
WNR	White cell nucleated
WDF	White cell differential
RET	Reticulocyte
PLT	Platelet
ITP	Immune Thrombocytopenic Purpura
TTP	Thrombotic Thrombocytopenic Purpura

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ABSTRACT

INTRODUCTION - Thrombocytopenia is a common clinical problem, which is defined as a platelet count less than $15x10^9$ /L although a cut off value of 10 x 10^9/L is more appropriate to identify clinically significant thrombocytopenia. Causes of thrombocytopenia can be subdivided into decreased platelet production, increased platelet destruction, increased splenic sequestration, and dilution. Investigation requires consideration of patient age, baseline platelet count, medical and surgical history, including any bleeding or thrombotic manifestations, family history, medication history, and physical examination findings. Immature Platelet fraction (IPF) is a novel parameter that helps in the diagnosis of thrombocytopenia by predicting megakaryopoiesis activity. So, this study is initiated to evaluate whether IPF can differentiate between thrombocytopenia due to decreased platelet production or increased platelet destruction and other causes of thrombocytopenia.

OBJECTIVE: To study the utility of platelet parameters like Immature platelet fraction (IPF), Plateletcrit (PCT), Mean platelet volume (MPV), in cases of patients having thrombocytopenia.

MATERIALS AND METHODS: A prospective hospital-based study was carried out on all the patients presenting with platelet count <100,000/µL. The patients who had a recent blood transfusion and cases which showed EDTA induced pseudo- thrombocytopenia were excluded from the study.

STUDY PERIOD: 1st December 2018 to 30th May 2020.

SAMPLE COLLECTION - Blood samples were collected in EDTA anticoagulated vacutainers and then run on SYSMEX XN 1000 for determination of Platelet count, IPF%, MPV and PCT. CBC parameters like Haemoglobin (Hb), RBC count, Total WBC count, WBC differential count, MCV, MCH, MCHC, Hematocrit (HCT) and Red Cell Distribution width (RDW) were taken as part of routine analysis. A peripheral smear examination was done for all patients.

RESULTS: A total of 172 patients were enrolled in the study. IPF% was found to be higher in thrombocytopenia due to increased destruction of platelets thus indicating higher megakaryopoiesis activity in these patients. Therefore, the invasive procedure of bone marrow study can be avoided in patients having responsive marrow. MPV and PCT were also slightly higher in thrombocytopenia due to increased platelet destruction than in patients with thrombocytopenia due to decreased platelet production. IPF% was found to be a better marker than other two parameters and the cut off value of IPF % biomarker to distinguish between thrombocytopenia due to increased platelet destruction and thrombocytopenia due to decreased platelet production was 9.2%.

CONCLUSION:

The estimation of IPF%, MPV and PCT is simple and rapid method that can be used for the evaluation of thrombocytopenia. IPF% is better marker to differentiate whether thrombocytopenia is due to increased platelet destruction or decreased platelet production. Thus, can be used effectively to determine the underlying etiology and the procedure of bone marrow biopsy can be avoided.

Key Words- Thrombocytopenia, Immature Platelet fraction

INTRODUCTION

Thrombocytopenia is a quantifiable decrease in the platelets, and it establishes a significant cause of generalized bleeding. A count of fewer than 150,000 platelets/µl is considered to be as "Thrombocytopenia". Platelet count in the range of 20,000- 50,000/µl can exacerbate post-traumatic bleeding, while platelet count less than 20,000 platelets/µl, may be related to spontaneous bleeding.

Platelets are critical for hemostasis, in that they form a temporary plug that stops bleeding and promotes key reactions in the coagulation cascade. Spontaneous bleeding due to thrombocytopenia frequently involves small vessels. Common sites of bleeding are skin and mucous membranes of the Gastrointestinal tract & Genitourinary tract.[1]

Decreased production of platelets or increased destruction of platelets can lead to thrombocytopenia. In cases having thrombocytopenia, the clinician needs to judge the prognosis based on clinical examination and daily evaluation of platelet counts. Bone marrow aspiration is one of the indications in patients with thrombocytopenia. But this procedure is invasive, time consuming and carries an overt risk of bleeding in few patients. With the introduction of new parameters like Immature Platelet Fraction (IPF), Plateletcrit (PCT) and Mean platelet volume (MPV), it will help with the precise management of patients having thrombocytopenia. IPF indicates the newer platelets released from the bone marrow. MPV is a measure of average size of platelet in the blood and it can be used as a surrogate marker of megakaryopoiesis.[2] PCT is the volume occupied by the platelets which reflects the platelet mass, and it is calculated using the formula PCT = platelet count × MPV/10,000.[2]

Many studies have found that these parameters can be rapidly assessed by fully automated hematology analysers, and help to evaluate the patients with thrombocytopenia.

OBJECTIVE OF THE STUDY

To study the utility of platelet parameters like IPF (Immature platelet fraction), PCT (Plateletcrit), MPV (Mean platelet volume), in cases of patients having thrombocytopenia.

REVIEW OF LITERATURE

HISTORY: -

Platelets were first identified by Max Schultze in the year 1865.[2] He labelled them as spherules which occur in small clumps and proposed that coagulation begins from these accumulations of spherules.[1] Later on, a German Anatomist Bizzozero described platelets as disc shaped, having parallel surfaces, round to oval structures with diameter 2–3 times smaller than the diameter of the red cells.[2]

Platelets are formed in the terminal stage of Megakaryopoiesis.[2] The pluripotent stem cells proliferate and differentiate via several intermediates into a megakaryoblast and then form megakaryocyte.[2] Megakaryopoiesis is regulated by many cytokines and multiple growth factors, out of which, Thrombopoietin plays a major role.[2]

Megakaryopoiesis involves nuclear division without simultaneous cell division, that results in formation of a large megakaryocyte having multiple nuclei and abundant cytoplasm.[2] This property is known as endomitosis.[2] The nuclear ploidy of a megakaryocyte is normally between 8N and 64N.[2] The cytoplasm contains a system of channel like structures made of lipids, that is called as Membrane Demarcation system.[2] There is organisation of these lipids into a bilayered membrane, once the disintegration of cytoplasm of megakaryocyte begins to take place.[2] These megakaryocytes develop pseudopod- like projections which release the platelets in circulation.[2]

On an average, a single Megakaryocyte is able to release 5000 platelets.[2] Under normal circumstances, platelets are produced at a constant rate, but under pathologic states, there is release of platelets at an earlier stage than normal. These released platelets are somewhat larger in size.

The large platelets have more RNA content and are considered as analogous to red cell reticulocyte, thus these are named as "Reticulated Platelets".[3] The rate of thrombopoiesis is determined by these reticulated platelets, which increases when production of platelets increases, and decreases when platelet production decreases.

The RNA content can be measured using dyes which bind to RNA. Reticulated platelets were first described by Ingram and coopersmith.[4] They suggested that these newly released platelets contain "reticulum" that can be stained with new methylene blue.[4]

The concentration of reticulated platelets is 2-3 times higher in the bone marrow than in peripheral blood. Platelets remain in circulation for 7-10 days, whereas, reticulated platelets have a lifespan of less than 1 day. Thus, they can be a good indicator of megakaryopoiesis in bone marrow, so they possess good clinical as well as diagnostic utility.

Platelets appear in peripheral smear as small, anucleate fragments with occasional reddish granules, measuring 2µm in diameter having volume of 8fl.

THROMBOCYTOPENIA :- "Thrombocytopenia is defined as a platelet count below the 2.5th lower percentile of the normal platelet count distribution".[5] The third US National Health and Nutrition Examination Survey (NHANES III) supported the lower limit of normal range as 150 x 10^9/L.[5] They suggested that the cut off value of value of 100 x 10^9/L is more appropriate for identifying an underlying pathology.[5]

CAUSES OF THROMBOCYTOPENIA[1]

Thrombocytopenia is platelet count <150 x 10^9/L. Patients with platelet count > 50 x 10^9/L are usually asymptomatic. Those with < 20 x 10^9/L have a tendency for spontaneous hemorrhage.[6] The causes of thrombocytopenia are broadly categorised into four groups.[1]

1. Decreased production of platelets
2. Increased destruction of platelets
3. Increased sequestration of platelets
4. Increased dilution

The important causes are subdivided into each group depending on the etiology:[1]

1. **DECREASED PRODUCTION OF PLATELETS**-
    a) Selective impairment of platelet production
    b) Drugs: Thiazides, cytotoxicity causing drugs, Alcohol
    c) Nutritional deficiencies: Vitamin B12 & folate deficiency
    d) Aplastic anaemia
    e) Bone marrow replacement
    f) Hematologic malignancies (Leukaemia), Carcinomas, Granulomatous diseases
    g) Myelodysplastic syndromes
    h) Ineffective haematopoiesis

2. **INCREASED DESTRUCTION OF PLATELETS** -
    a) Immunologic causes: Acute Immune Thrombocytopenic purpura, Chronic Immune Thrombocytopenic purpura, Systemic lupus erythematosus, Neonatal Alloimmune Thrombocytopenia, Posttransfusion.
    b) Non immunologic causes: Disseminated intravascular coagulation, Thrombotic Thrombocytopenic purpura.

c) Infections: Dengue fever, Malaria, Measles, Hepatitis C virus, Helicobacter pylori, CMV, Human immunodeficiency virus (HIV), Other viral infections.

3. **INCREASED SEQUESTRATION OF PLATELETS**-

   Hypersplenism

4. **INCREASED DILUTION**-

   a) Massive transfusions

   b) Pregnancy associated: Gestational Thrombocytopenia, HELLP syndrome, Pre-Eclampsia, Abruptio Placentae.

QUANTIFICATION OF PLATELETS: -

Platelets can be counted either by manual methods or by automated methods. Manual methods include counting the number of platelets using a Neubauer chamber, which contains a precise volume of EDTA anticoagulated blood sample. Another way is counting platelets on a Romanowsky stained peripheral blood smear.

Till 2007, the manual method of counting platelets on a stained peripheral smear was considered Gold standard.[7] Platelets are now counted by automated methods using Automated haematology analysers. Many methods are employed like Impedance platelet counting, optical scattering, and fluorescence.[7] Wallace Coulter was the first who described "Coulter Principle". In this method, all cells are considered as non-conducting particles.[7] Whenever a cell passes through the sensing zone of an aperture, suspended in a conducting medium containing electrolytes, the change in electric impedance is detected.[7] Every cell passing through that aperture provides resistance, which can be seen as a peak in the voltage. The number of cells passing corresponds to the number of peaks detected by a voltmeter. The peaks also depend on the volume of each cell. A graph is plotted on x-axis corresponding to the volume of

each cell and y-axis corresponding to number of cells passed. The area under curve obtained gives an accurate platelet count.

PLATELET QUANTIFICATION METHOD USED IN PRESENT STUDY

SYSMEX XN-1000 is a fully automated haematology analyser which is used in this study, and it has four channels. The WNR channel (White cell nucleated channel), WDF channel (White cell differential channel), RET channel (Reticulocyte channel) and the PLT channel (Platelet channel).[8]The WNR channel helps to measure the nRBCs. All the nRBCs are measured using principle of light scatter and fluorescence.[9] The WDF channel is for performing the differential WBC count and it includes basophil count.[9] The PLT channel uses RNA dye like oxazine which stains the RNA of platelets. This channel is used for any routine sample or can be used for reflex testing if the platelet count is too low in a particular sample, and in that case an extended platelet count is performed to give more accurate results.[9] This analyser also has a Low WBC mode in which samples with a WBC count of less than 0.5×10^9/L are run as a reflex test to obtain an accurate WBC differential count.[9]

In this haematology analyser, the blood cells are classified using a DC (Direct current) detection method and flow cytometry using a semiconductor laser. A specific channel (PLT-F) is used for the measurement of IPF% and it is measured using fluorescence method using oxazine dye, which binds specifically to the nucleic acid -rich platelet organelles like ribosomes and mitochondria.[9,22] The platelets are irradiated using a semiconductor laser beam, and are plotted on a 2-D scattergram. PLT-F channel improves the gating of the platelets by depicting side fluorescence (based on RNA content of platelets), side scatter (based on intracellular content of platelets) and forward scatter (based on size of the platelets). Since, the reticulated platelets or the immature platelets have larger size and more RNA content as

compared to the mature platelets, so they are easily differentiated in the scatter plot. The mature platelets are detected by the Impedance method (PLT- I).[9,22]

RETICULATED PLATELETS

The platelets having more RNA content are younger platelets and they are called as "Reticulated Platelets".[10] RNA is present within the platelets, when they are released from cytoplasm of the megakaryocytes. This RNA was considered to be a vestigial remnant, but recent evidences suggest that platelets utilise this RNA for synthesis of proteins.[10]

Back in 1969, Ingram and Coopersmith, described reticulated platelets, after carrying out a study on Beagle dogs having acute blood loss.[10]. Later on, Becton and Dickinson suggested that the platelet RNA content can be measured using flow cytometry. A dye like Thiazole Orange, can enter the cells and bind to RNA and DNA. Due to its fluorescence emitting property, it can be easily picked on a flow cytometer.[10] Kienast and Schmitz then, proposed that Thiazole Orange can be a good indicator of rate of thrombopoiesis.[10] This was based on the observation that, in patients having thrombocytopenia, the proportion of reticulated platelets is inversely related to platelet count.[10] They observed that patients having mild thrombocytopenia had normal or slightly decreased number of reticulated platelets. And, patients with platelet count < 20,000/µL showed higher number of reticulated platelets.[10] The possible explanation for this can be that, in patients with severe thrombocytopenia, the rate of platelet production is lower, or it can be because the reticulated platelets undergo destruction at a higher rate when the platelet count falls below 50000/µL. They also observed that when platelet counts fall < 50,000/µL, the lifespan of platelets is reduced from 7-10 days to less than 3 days. Further fall in platelet count < 20,000/µL, reduces the lifespan to less than 1 day.[1]

A major limitation of flow cytometric analysis was its wide variation in methodology. The normal reference range of reticulated platelets was between 1% -15%, and this wide range was due to lack of standardization methods. Many factors like the type of fluorescent dye used, its concentration used, the incubation time and temperature, varied in different set-ups.[10] Also, the technique of flow cytometry requires a lot of skill and expertise and it is not always available on a 24/7 basis, therefore its use was limited.[10]

In fully automated haematology analysers a fluorescent dye Auramine O fluorescent dye is used for staining RNA using 488 nm Argon laser. A graph is plotted between forward light scatter (corresponding to size) and fluorescence (corresponding to RNA). By this method, reticulated platelets could be differentiated from mature platelets. This principle was then incorporated by newer haematology analysers for determination of a parameter called as Immature platelet fraction (IPF).[10] In these analysers, IPF is measured in the reticulocyte channel. The mature platelets are seen as “Blue dots”. The immature ones are seen as “Green dots”.

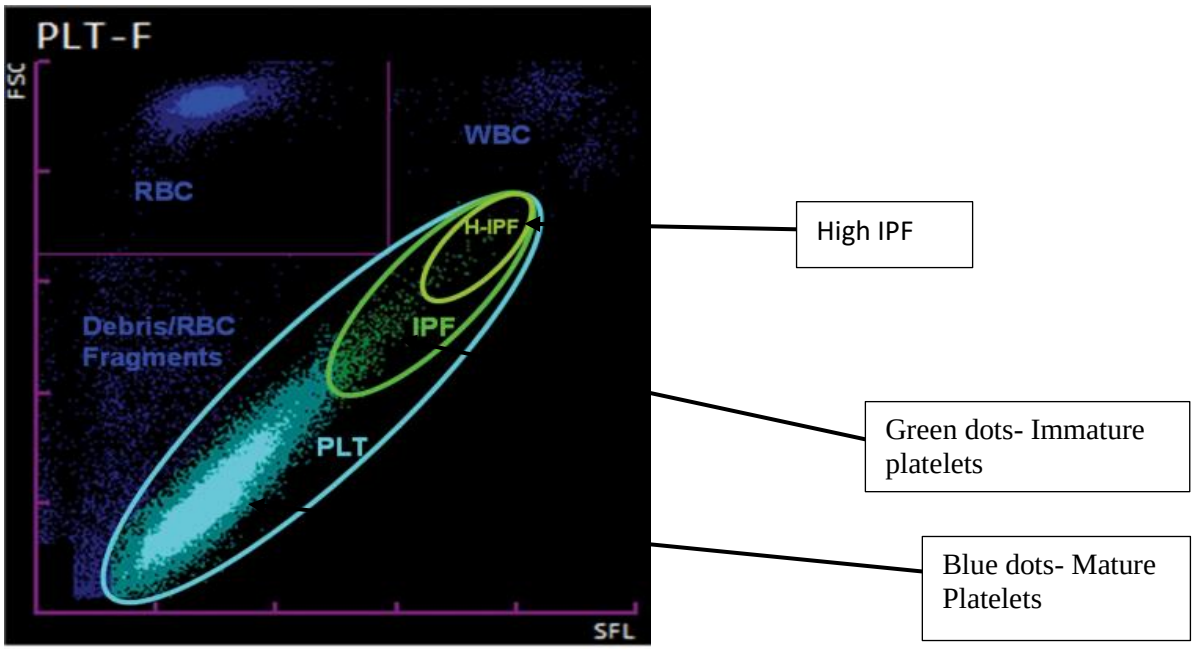

Figure 1. Scattergram from a patient with high IPF related parameters.

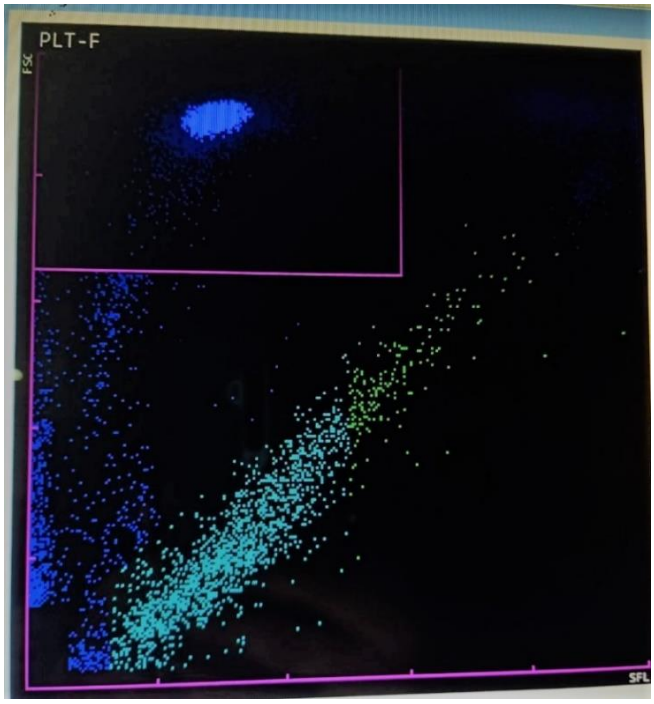

Figure 2. Scatter diagram of patient with normal IPF

CLINICAL UTILITY OF IPF IN THROMBOCYTOPENIA -

"Immature platelet fraction is usually expressed as a proportional value of the total optical platelet count to indicate the rate of platelet production, although an absolute count can also be obtained."[10] The IPF can be measured easily during routine blood sample analysis and results can be obtained immediately.[44] The normal range of IPF% is 1.1-6.1 with a mean of 3.4%.[28]

In the year 2004 in a study conducted by Briggs et al[3], for evaluation of patients with thrombocytopenia, IPF was found to be highest in ITP patients (Immune Thrombocytopenic Purpura).

In the year 2005, in a study conducted by Kuwana *et al* [13], they considered 46 patients with Immune thrombocytopenic purpura (ITP) and 16 as having another disorder like myelodysplastic syndrome, aplastic anaemia, amegakaryocytic thrombocytopenia. They found that

elevated percentage of reticulated platelets was seen in thrombocytopenia due to increased platelet destruction along with elevated thrombopoietin levels.

In the year 2007 in a study conducted by Monteagudo *et al*[12] they divided their study population into three groups, thrombocytopenia with normal or decreased thrombopoietic activity, thrombocytopenia with increased thrombopoietic activity and a control group. They determined the percentage of reticulated platelets by flow cytometry, with dual-labelling method of identification of platelets. They found that the value of reticulated platelets of >11.08% had good sensitivity and specificity for diagnosing thrombocytopenia due to increased platelet destruction.[12]

In the year 2011 in a study conducted by Gabriele Straub *et al*[14] patients with congenital and acquired disorders like Fanconi Anemia, Thrombocytopenia with absent radii (TAR), severe aplastic anemia (SAA) and myelodysplastic syndrome (MDS) where megakaryocytes are scarce, the IPF% is found to be a good indicator of thrombopoiesis.[14] In such conditions, IPF% is markedly reduced as compared to patients having Acute leukemia.[14]

Some studies take into account the absolute IPF values to determine the underlying etiology. The absolute IPF is the total number of immature platelets per unit volume (% IPF x platelet count). The absolute IPF reflects the number of immature platelets in circulation.[15]

In cases of thrombocytopenia due to decreased production of platelets, like in Acute myeloid leukemia or Myelodysplastic Syndrome, the platelet function is impaired due to underlying malignancy or chemotherapy or concurrent functions. In such patients, the percentage of reticulated platelets is found to be lower.[16]

The ideal time for determination of IPF % is within 1-12 hours of collection of the sample.[17] The analysis should not be done within the first hour after sampling. A reduction in the IPF%

is seen during the first hour due to the swelling of the platelets caused by the anticoagulant EDTA.[17]

The parameter IPF % reflects the severity of damage to the platelets and indicates the rate of production of platelets in bone marrow. In patients with bone marrow dysfunction, there is decreased production of platelets. In such patients the IPF% was found to be low.[18] And in thrombocytopenia due to increased destruction of platelets, the IPF% remains high and a fall in increased destruction is followed by fall in IPF to normal or near normal values. Therefore, IPF% estimation is useful in differentiating these conditions.[18]

Even though the reference intervals obtained for IPF% differed in different studies, it is still considered to be a better indicator of thrombopoiesis as compared to other platelet indices. The difference in reference intervals is due to the use of different analysers for estimation of IPF% like SYSMEX XE 2100, XE 5000 and XN series. SYSMEX XN series utilises different principles of IPF measurement from its older versions, so it is considered to be better.[19]

CLINICAL UTILITY OF MPV IN THROMBOCYTOPENIA –

The Mean Platelet Volume (MPV) is a parameter that can be obtained along with routine CBC parameters by an automated haematology analyser and it is a measure of average size of the platelets in the circulation.[20] The functional activity of the platelets is determined by this parameter. It is proven that the larger platelets are metabolically as well as enzymatically more active than the smaller platelets. There is also an association of MPV with the aggregation of platelets. There is an increased expression of adhesion molecules like Glycoprotein IIb/IIIa and P-Selectins in larger and newly released platelets.[21]

The normal range of MPV is determined by multiple studies as 7.5-12 fL. Raised MPV is seen in conditions like ITP, DIC, pre-eclampsia and (Haemolysis, Elevated liver enzymes,

Low platelets) HELLP syndrome in pregnancy, and in hyperthyroidism.[22] Reduced MPV is seen in conditions with decreased production of platelets like Aplastic Anemia, Bone marrow failure, Ineffective haematopoiesis, hypothyroidism, iron deficiency anemia and HIV/AIDS.[22]

Many studies have shown that patients having thrombocytopenia due to increased destruction of platelets have higher values of MPV as compared to patients having thrombocytopenia due to decreased platelet production.[23]

In a study conducted by Sridhar Reddy *et al*[24], they divided their study population into groups and studied the MPV for comparison of these groups. Scatter plots and mean values of MPV showed that MPV was higher (10.59±1.24) in patients having thrombocytopenia due to increased destruction of platelets as compared to decreased production group (8.37±0.96).

The utility of MPV has been studied in a study conducted by Hsien-Li Huang *et al*[45] where they evaluated the role of MPV in Unstable Angina and Acute Myocardial Infarction and found that MPV was raised in these conditions as compared to controls.

In a study conducted by Mikala Klok Joergensen[46] he determined the reference intervals for both MPV and IPF% and concluded that these parameters remained stable in different age groups and sex.

In a study conducted by Fiona Swain *et al* [47], they found that MPV is raised in ITP, MDS and pancytopenia due to megaloblastic anemia. The parameter MPV can help to differentiate between ITP and hypoproliferative thrombocytopenia, although the sensitivity and specificity can vary between different studies.

In a study conducted by Lalita Norrasethada *et al* [51] they determined a cut off value of ≥8.8 fL to distinguish thrombocytopenia due to increased platelet destruction or decreased platelet

production. Another study conducted by Khairkar et al[54], MPV was able to differentiate hyperdestructive or hypodestructive thrombocytopenia or due to abnormal pooling.

CLINICAL UTILITY OF PCT IN THROMBOCYTOPENIA –

The parameter Plateletcrit (PCT) is a measure of total platelet mass i.e. the total volume occupied by the platelets in blood. In normal circumstances, the amount of platelets is maintained by regeneration and elimination. Plateletcrit is an effective tool for screening of patients with platelet abnormalities. The normal range of PCT is 0.22-0.24%.[25]

In a study, it was found that a cut off value of 0.20-0.36% was helpful to differentiate thrombocytopenia due to either decreased production or increased destruction with sensitivity of 90% and can also be used in place of platelet count to decide whether patients need transfusion or not.[26] Other studies found that PCT alone cannot differentiate between thrombocytopenia due to decreased production or increased destruction.[27]

In a study conducted by Moon Jin Kim *et al* [28], the mean values of platelet count, mean platelet volume and plateletcrit were higher in primary immune thrombocytopenia (increased destruction) than in acute myeloid leukemia patients (decreased platelet production).

MATERIALS AND METHODS

SOURCE OF DATA: - Both Inpatient and Outpatients who were referred to the Department of Pathology, BLDE (Deemed to be University), Shri B.M. Patil Medical college, Hospital and research centre, Vijayapura.

STUDY PERIOD :- 1st December 2018 to 30th May 2020.

METHOD OF SAMPLE COLLECTION:-

Blood samples were collected in EDTA vacutainer tube, these samples were run in SYSMEX XN 1000 fully automated haematology analyser (Sysmex, Kobe, Japan). All the samples were run in the analyser within 4 hours of collection. A complete blood count analysis including the parameters Haemoglobin (Hb), RBC count, Total WBC count, WBC differential count, MCV, MCH, MCHC, HCT and RDW of all the patients was done. The reading of IPF % was recorded, along with other platelet parameters MPV & PCT.

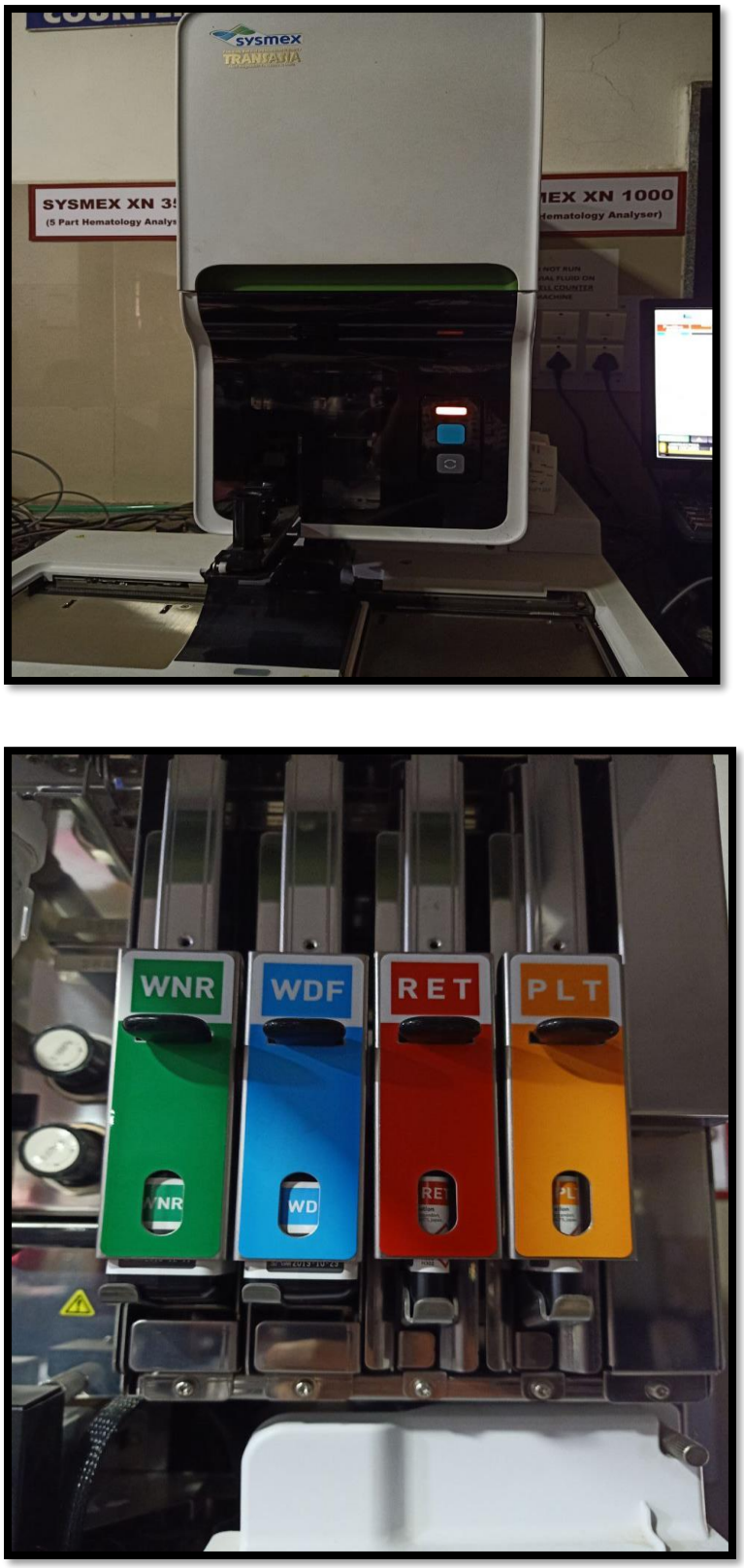

Fig 3. SYSMEX XN 1000 automated hematology analyser

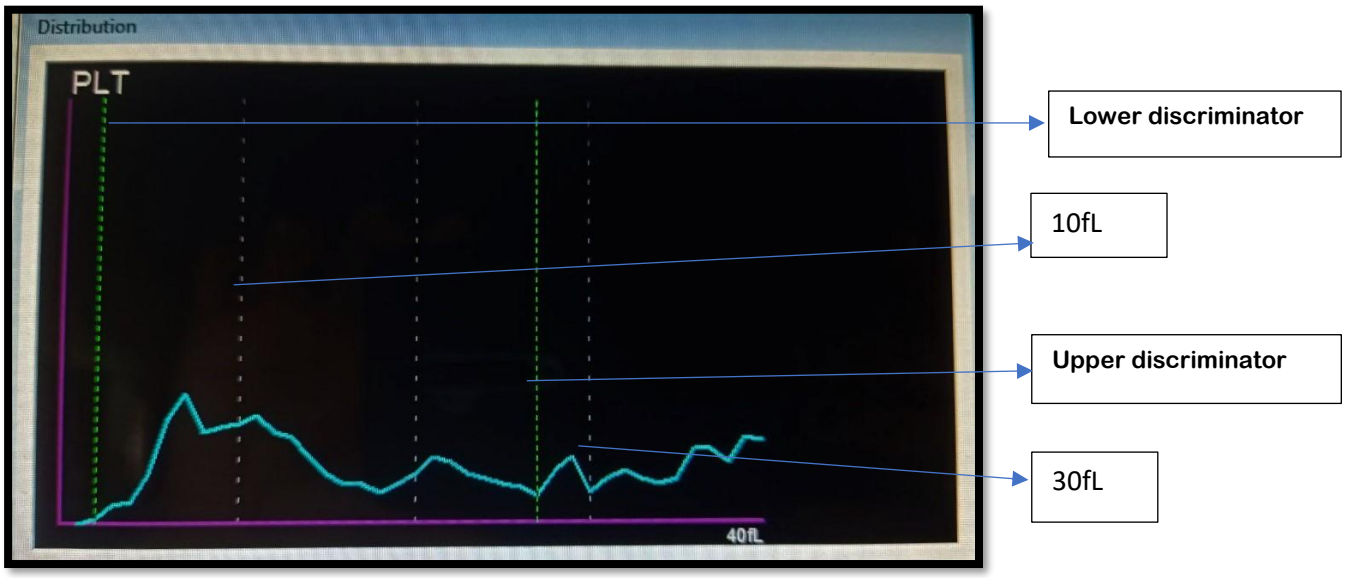

Figure 4. Platelet Histogram in a patient having thrombocytopenia

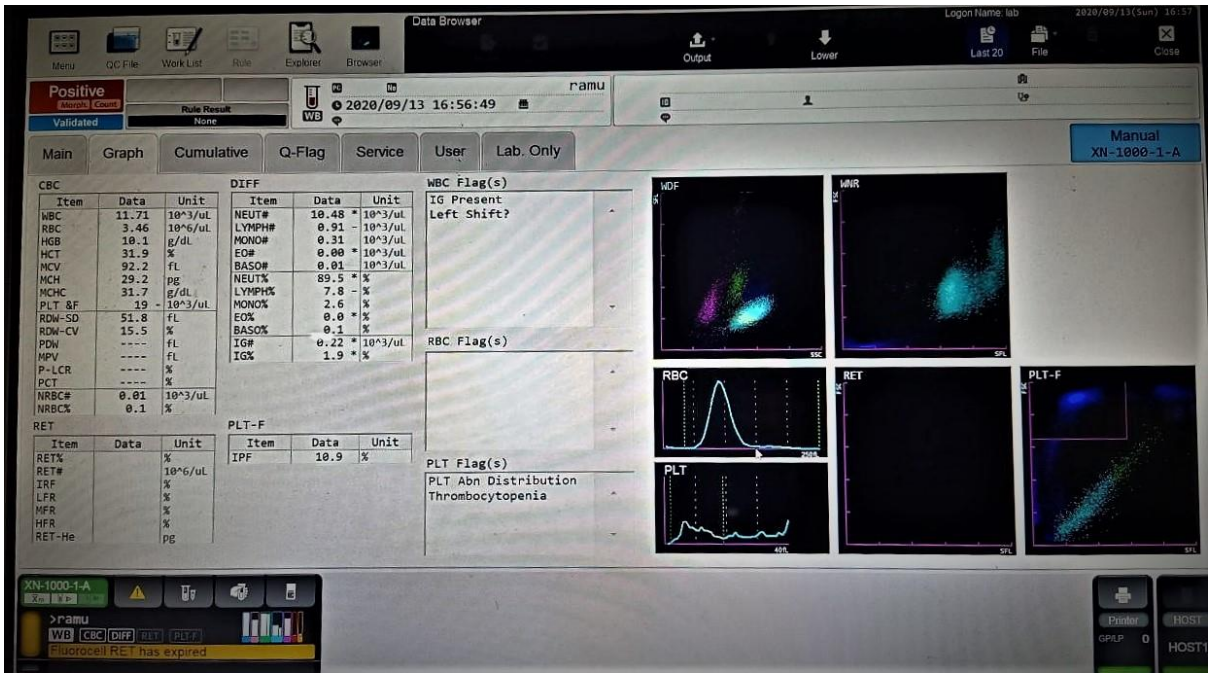

Figure 5. SYSMEX XN 1000 showing how the results are displayed in a low platelet sample

INCLUSION CRITERIA : - All the patients presenting with platelet count ≤100,000/μL were included in the study.

EXCLUSION CRITERIA :-

1. The samples which are collected 4 hrs prior to testing.

2. Patients having history of whole blood transfusion in past 3 days.

3. Cases in which the analyser showed spuriously low platelet count, and which showed platelet clumps on peripheral smear.

SAMPLE SIZE:

- With anticipated Proportion of IPF in ITP 29.8% the minimum sample size is 130 patients with 1% level of significance and 5% absolute error.

  Formula used

- $$n=\frac{z^2\ p*q}{d^2}$$

  Where Z= Z statistic at α level of significance

  d^2= Absolute error

  P= Proportion rate

  q= 100-p

STATISTICAL ANALYSIS:

- Data will be represented using Mean (Median) ±SD, Range, percentages and diagrams.
- Differences between quantitative variables is calculated using unpaired t test/ Mann Whitney test or ANOVA/ Kruskal Walli's test with post hoc analysis for 2 or more groups. Association between categorical data is calculated using chi square test or Fisher's Exact test.
- Correlation analysis is done using Pearson's/ spearman's correlation coefficient.
- Diagnostic accuracy of IPF is estimated by roc curve.

RESULTS

The study population comprised of total 172 patients. The blood samples of these patients were analysed in SYSMEX XN 1000 fully automated haematology analyser. Along with the Complete Blood count, IPF% was determined. MPV & PCT were also assessed as additional parameters. All the parameters were statistically analysed.

(i) AGE DISTRIBUTION

AGE (YEARS)	NO. OF PATIENTS	PERCENTAGE (%)
<1	11	6.4
1- 10	18	10.5
10 - 19	22	12.8
20 - 29	34	19.8
30 - 39	27	15.7
40 - 49	20	11.6
50 - 59	13	7.6
60 - 69	13	7.6
70+	14	8
Total	172	100

Table 1. Age of all the patients and the number of patients in each group with percentage

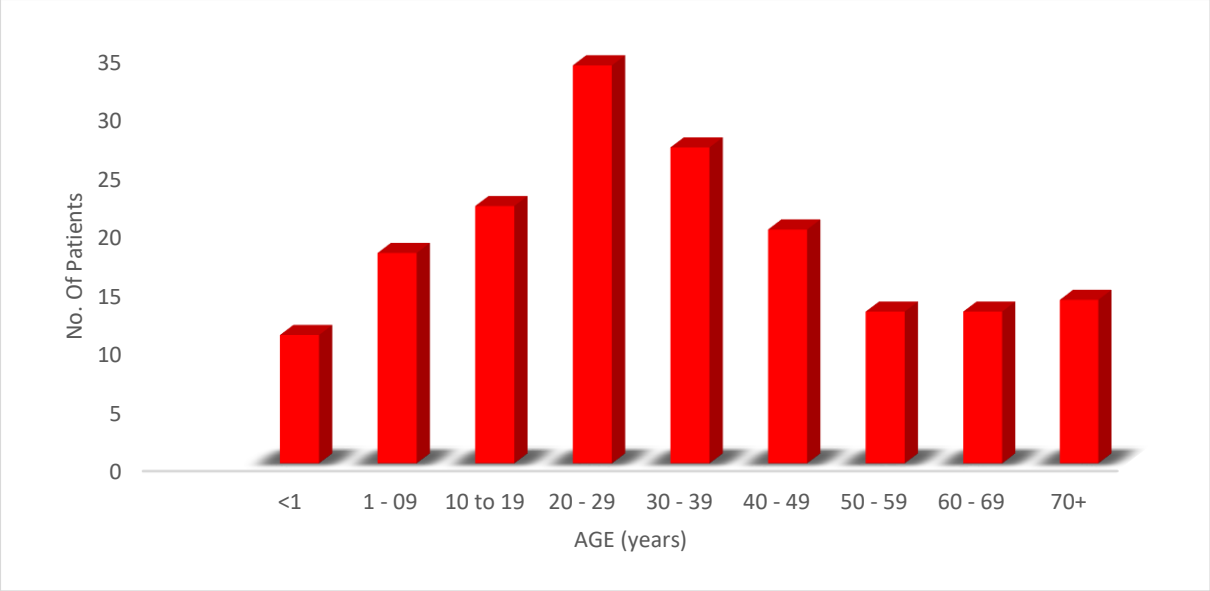

Figure 6. Age wise distribution of patients in each group

Among all the patients (N = 172) in the study, the majority of patients were in age group 20 to 30 years comprising of 34 cases (19.8% of study population). The detailed representation is shown in Table 1 & Figure 6.

In this study, the minimum age was of Day 1 baby and maximum was 91 years and the mean age of presentation in this study was 32.7 years.

(ii) GENDER DISTRIBUTION

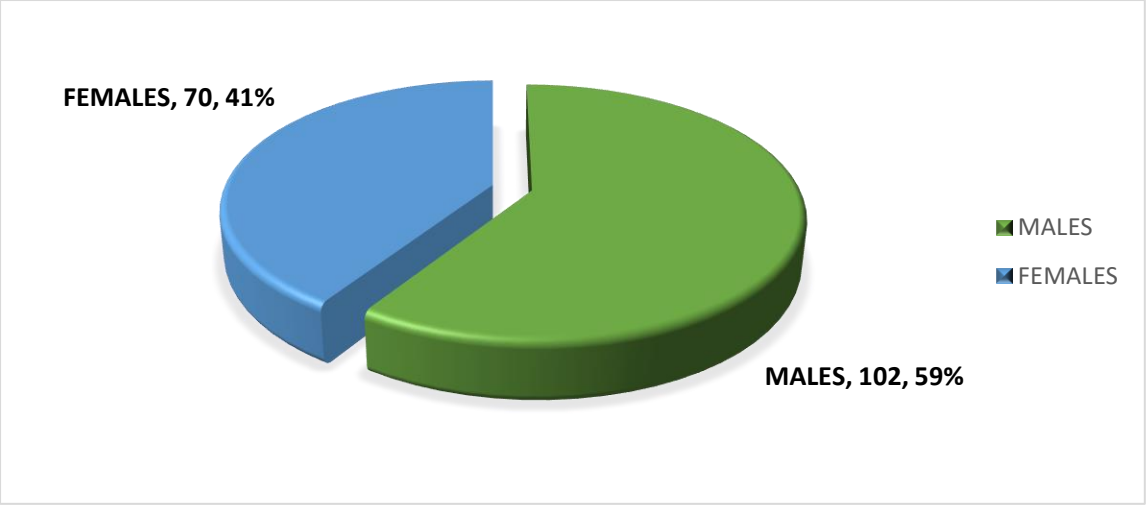

Figure 7. Pie diagram showing sex distribution of study population

Among all the patients included in this study, 102 were males and 70 were females comprising 59% and 41 % of total cases respectively.

(iii) DISTRIBUTION OF PATIENTS ACCORDING TO PLATELET COUNT

PLATELET COUNT	No. of patients	Percentage
< 20000	23	13.4
20000 – 39999	29	16.9
40000 – 59999	32	18.6
60000 – 79999	38	22.1
80000-100000	50	29.1
Total	172	100

Table 2. Platelet count distribution among study population

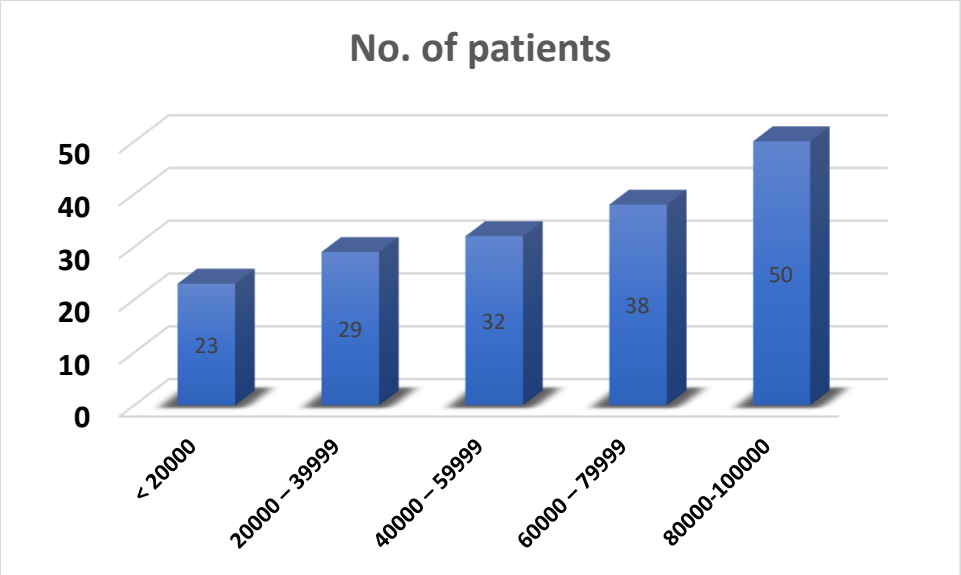

Figure 8. Bar diagram showing distribution of cases according to platelet count

In this study, the maximum number of patients had Platelet count in the range of 80000-100000/µL with Mean value 56941.86 and Standard deviation 27268.15.

(iv) **IPF % IN STUDY POPULATION**: -

The normal range of IPF% is 1-7%.

Among all the patients, 48% cases had IPF% below 7 and 52% cases had IPF% >7.

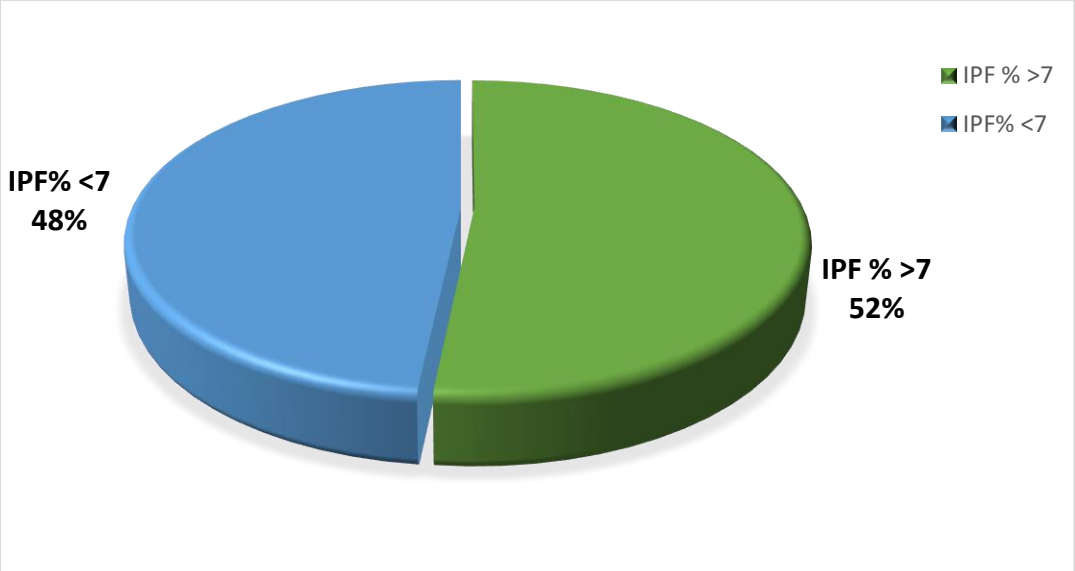

Figure 9. Pie diagram showing IPF distribution

(v) MPV IN STUDY POPULATION: -

The normal range of MPV is 8-12fL.[35]

In this study, 114 patients had MPV within the normal range, and 58 patients had raised MPV > 12.

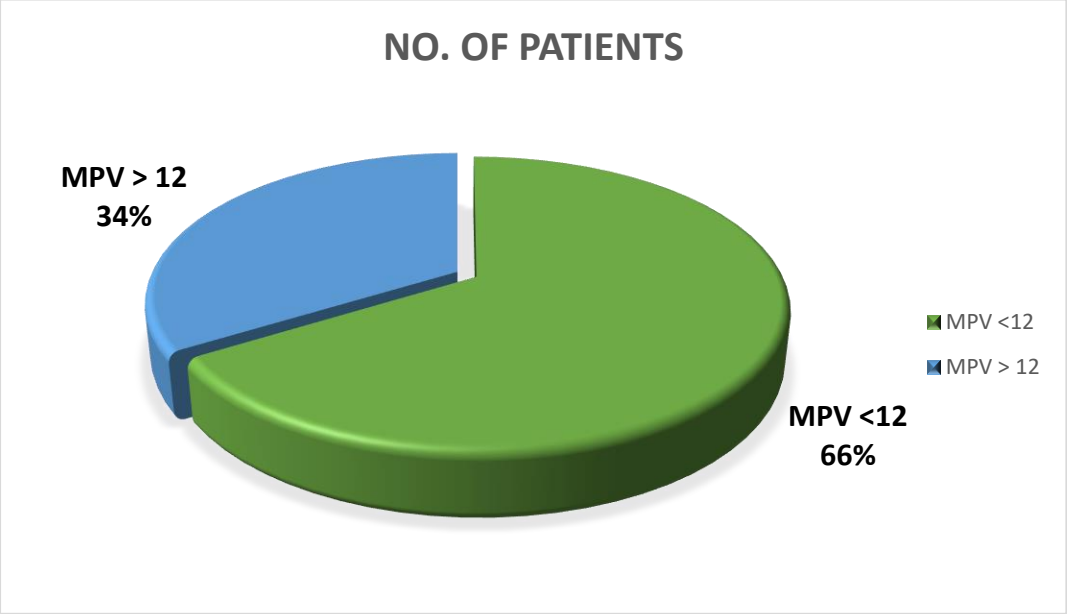

Figure 10. Pie diagram showing MPV distribution

(vi) PCT IN STUDY POPULATION: -

In this study, none of the patients had PCT values within normal range (0.22-0.24%), All patients had deranged PCT values.

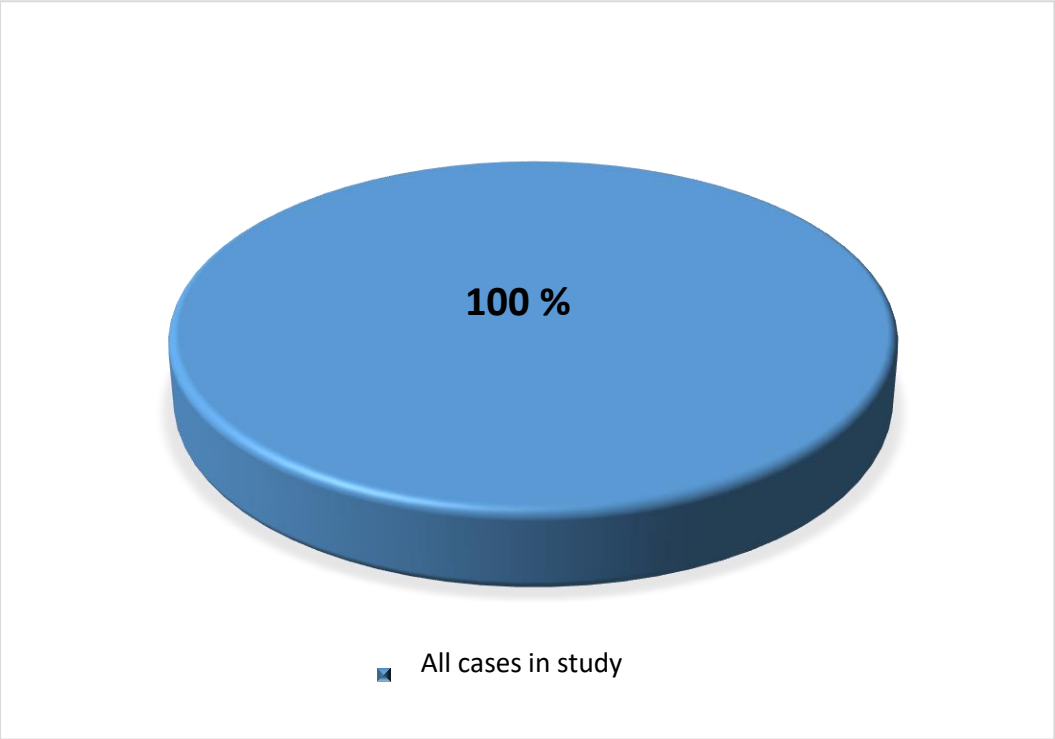

Figure 11. Pie diagram showing PCT distribution

(vii) CAUSES OF THROMBOCYTOPENIA & CLINICAL DIAGNOSIS

ETIOLOGY OF THROMBOCYTOPENIA	CASES	NO. OF PATIENTS	PERCENTAGE
INCREASED PLATELET DESTRUCTION	Infectious Causes – Dengue, Viral fever, Malaria, Chikungunya, HIV	67	38.9
	Neonates	11	6.3
	Others (ACS, Drug intake, DIC)	12	6.9
DECREASED PLATELET PRODUCTION	Deficiency Causes- IDA, Vit B12/Folate	14	8.1
	Alcoholic Liver Disease	7	4.5
	Others- (Leukemia, Malignancy, TB, MDS, Thalassemia)	11	6.3
INCREASED SEQUESTRATION	-	0	0
DILUTION	-	0	0
OTHER CAUSES	Pregnancy Related	10	5.8
	Acute Blood Loss	16	9.3
	Chronic Kidney Disease	8	4.6
	Diabetes, Laparotomy, Post-surgery	16	9.3
	Total	**172**	**100**

Table 3. Causes of thrombocytopenia categorised based on etiology

(viii) INCREASED DESTRUCTION OF PLATELETS

Among all the patients in this group, the maximum number of cases were of Dengue fever (47%) followed by Viral fever (22%). All cases of Dengue were serology confirmed NS 1 or IgM antibody positive cases.

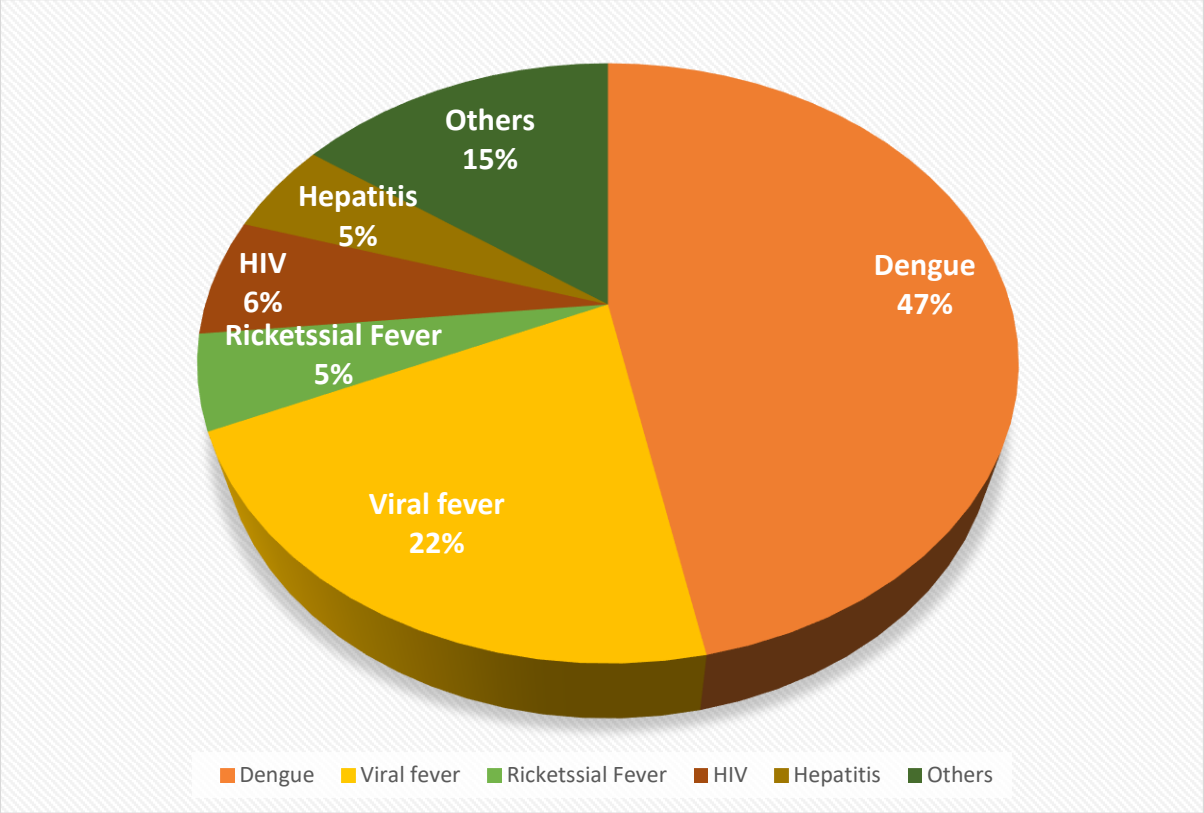

Figure 12. Pie diagram showing distribution of cases in thrombocytopenia due to increased destruction of platelets

(ix) DECREASED PLATELET PRODUCTION

In this study group, there was equal distribution of cases having thrombocytopenia due to iron deficiency anemia, Vit B 12 deficiency and alcoholic liver disease (22%).

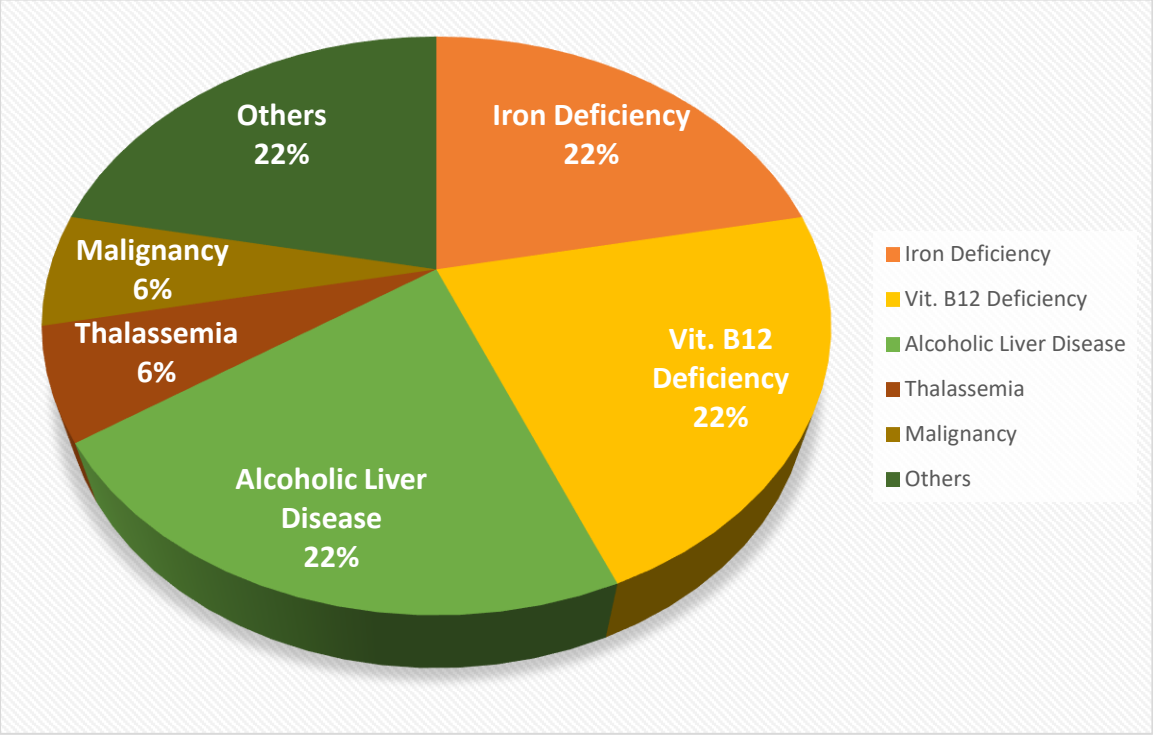

Figure 13. Pie diagram showing distribution of cases having thrombocytopenia due to decreased platelet production

(x) PLATELET COUNT COMPARISON BETWEEN TWO GROUPS

In the present study, we found that the mean platelet count was found to be higher in patients with thrombocytopenia due to increased destruction of platelets as compared to decreased production. (Table 4 & Figure 14)

	THROMBOCYTOPENIA	N	MEAN	STANDARD DEVIATION	P Value
PLATELET COUNT	INCREASED DESTRUCTION	90	59204.5	18000	<0.005
	DECREASED PRODUCTION	32	48939.3	21000	

Table 4. Showing comparison of mean platelet count among two groups

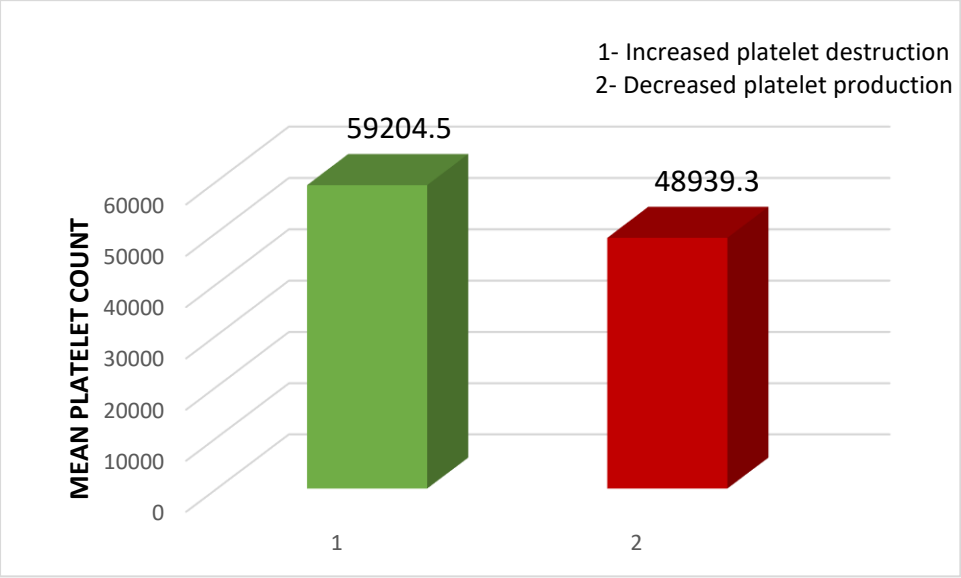

Figure 14. Comparison of mean platelet count among two groups

(xi) IPF% COMPARISON BETWEEN TWO GROUPS

In the present study, we found that the mean IPF% was much higher in thrombocytopenia due to increased destruction as compared to thrombocytopenia due to decreased platelet production. (Table 5 & Figure 15)

	THROMBOCYTOPENIA	N	MEAN	STANDARD DEVIATION	P Value
IPF%	INCREASED DESTRUCTION	90	9.38	1.05	<0.005
	DECREASED PRODUCTION	32	7.37	3.25	

Table 5. Showing comparison of mean IPF% among two groups

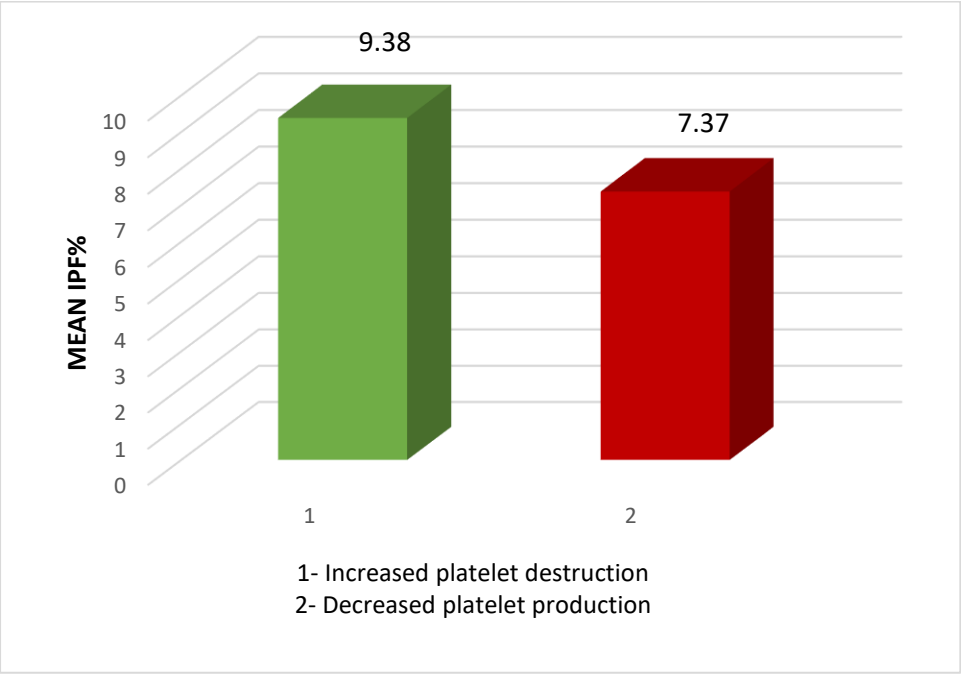

Figure 15. Showing comparison of mean IPF% among two groups

(xii) MPV COMPARISON BETWEEN TWO GROUPS

In this study, we found that the mean MPV values were slightly higher in thrombocytopenia due to increased platelet destruction as compared to thrombocytopenia due to decreased platelet production. (Table 6 & Figure 16)

	THROMBOCYTOPE-NIA	N	MEAN	STANDARD DEVIATION	P Value
MPV	INCREASED DESTRUC-TION	90	11.73	0.3	<0.005
	DECREASED PRODUC-TION	32	11.30	0.15	

Table 6. Showing comparison of mean MPV among two groups

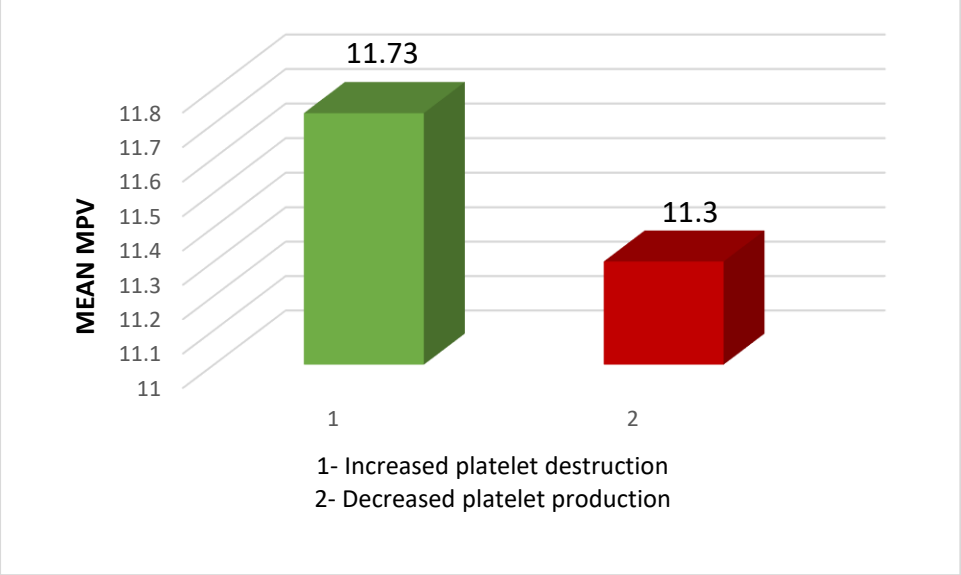

Figure 16. Showing comparison of mean MPV among two groups

(xiii) PCT COMPARISON BETWEEN TWO GROUPS

In this study, we found that the mean PCT values were slightly higher in thrombocytopenia due to increased platelet destruction as compared to thrombocytopenia due to decreased platelet production. (Table 7 & Figure 17)

	THROMBOCYTOPENIA	N	MEAN	STANDARD DEVIATION	P Value
PCT	INCREASED DESTRUCTION	90	0.093	0.02	<0.005
	DECREASED PRODUCTION	32	0.091	0.04	

Table 7. Showing comparison of mean PCT among two groups

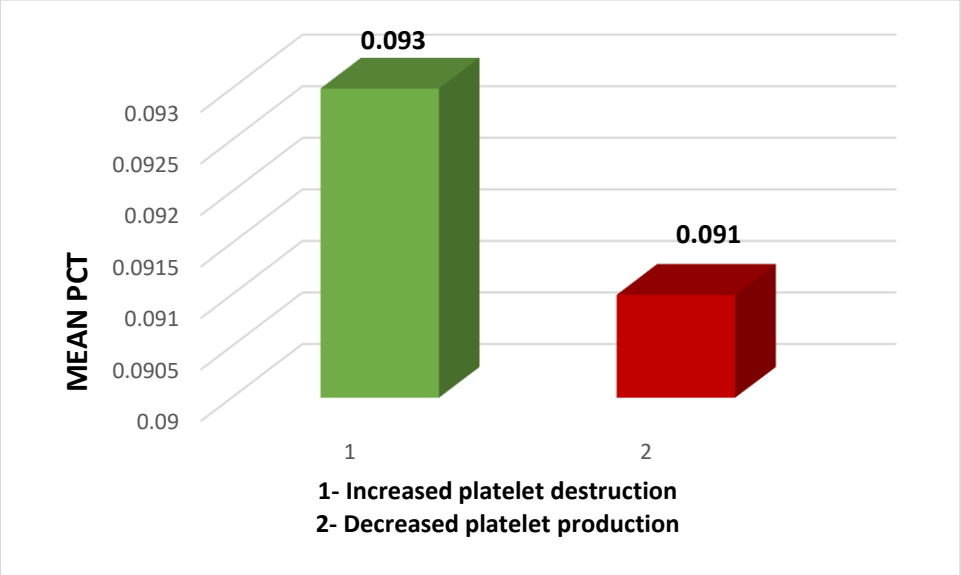

Figure 17. Showing comparison of mean PCT among two groups

(xiv) CORRELATION OF PARAMETERS WITH PLATELET COUNT IN THROMBOCYTOPENIA DUE TO INCREASED PLATELET DESTRUCTION

In this group, the IPF% showed negative correlation with platelet count which was statistically significant. ($p<0.005$)

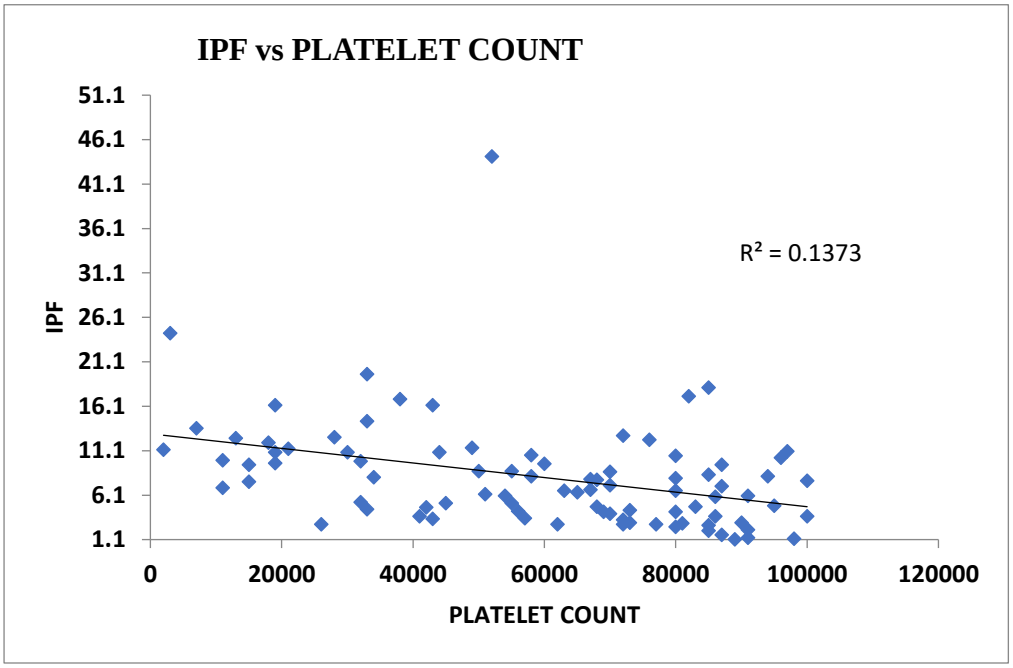

Figure 18. Scatterplot showing correlation of IPF with platelet count in thrombocytopenia due to increased destruction of platelets.

In the group of thrombocytopenia due to increased destruction of platelets, the correlation between MPV and platelet count was not significant. (Figure 19)

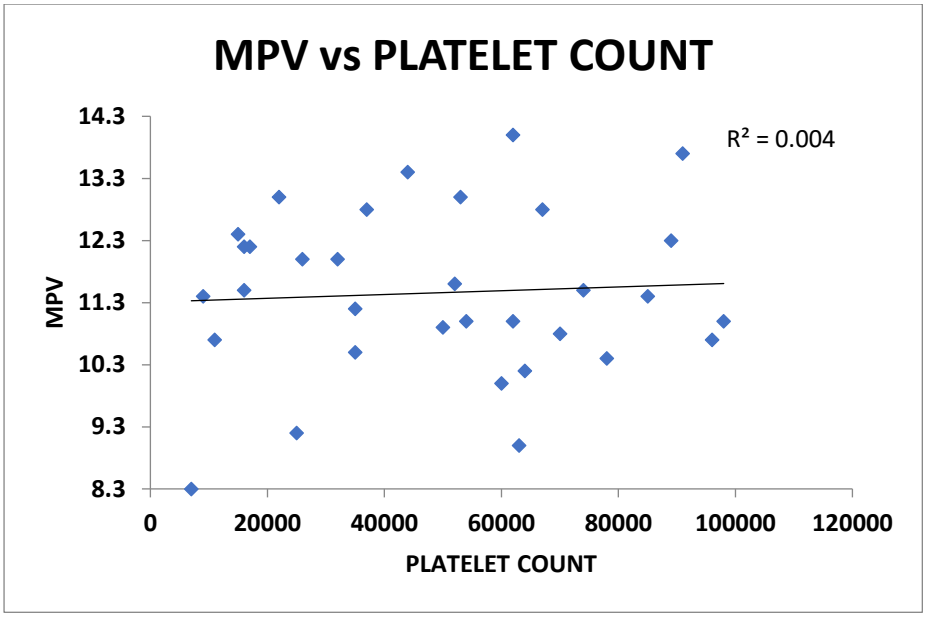

Figure 19. Scatterplot showing correlation of MPV with platelet count in thrombocytopenia due to increased destruction of platelets.

In the group of thrombocytopenia due to increased destruction of platelets, PCT showed positive correlation with the platelet count which was statistically significant (p=0.005). (Figure 20)

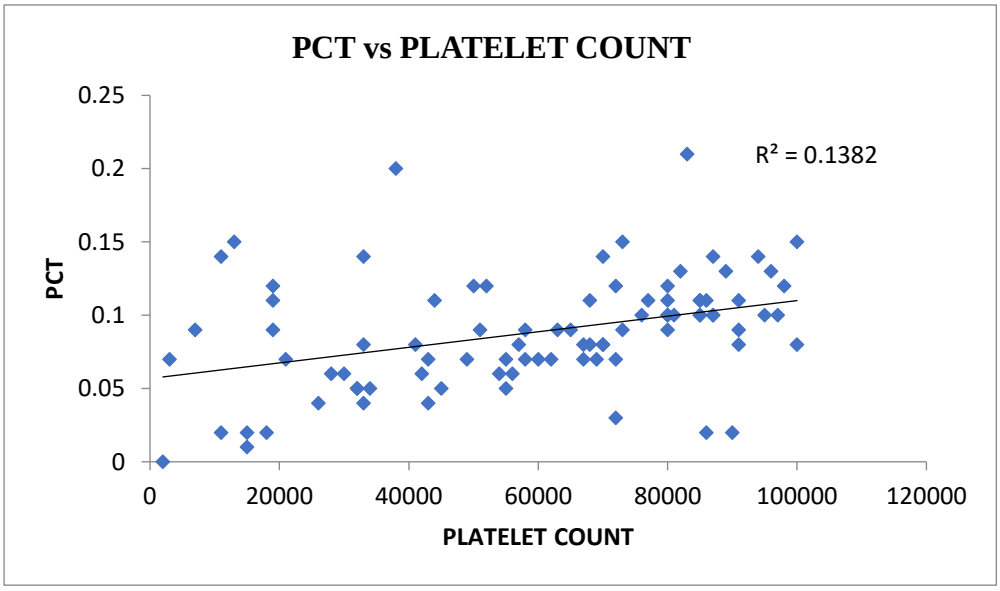

Figure 20. Scatterplot showing correlation of PCT with platelet count.

(xv) CORRELATION OF PARAMETERS WITH PLATELET COUNT IN THROMBOCYTOPENIA DUE TO DECREASED PLATELET PRODUCTION

In this study group, IPF % showed negative correlation with platelet count as shown in figure 21 ($p<0.005$).

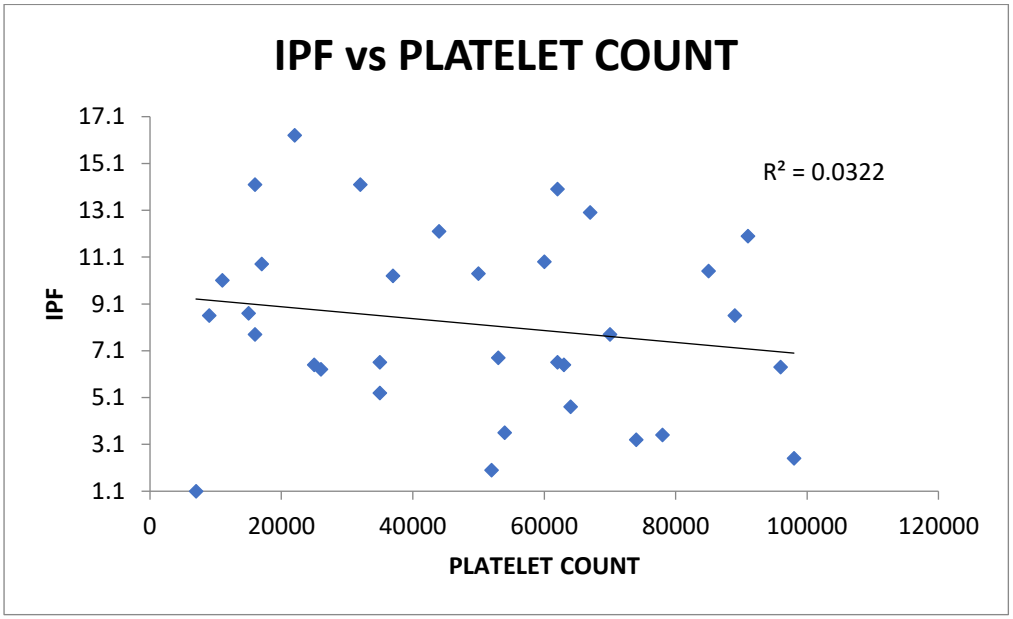

Figure 21. Scatterplot showing correlation of IPF with platelet count

In this study group, the correlation of MPV with platelet count was not statistically significant. (Figure 22)

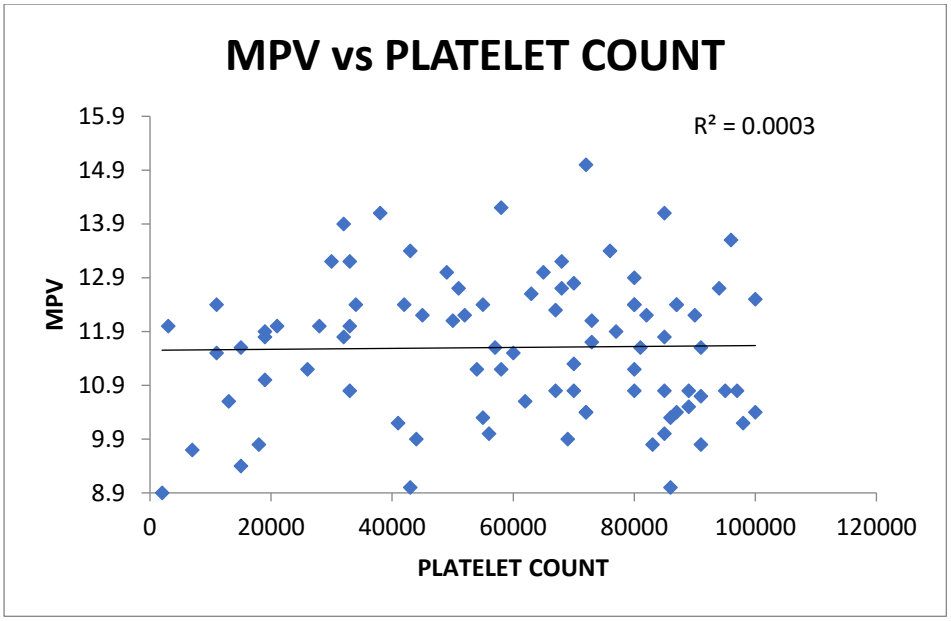

Figure 22. Correlation of MPV with platelet count in thrombocytopenia due to decreased platelet production

In this study group, the correlation of PCT with platelet count was not statistically significant.

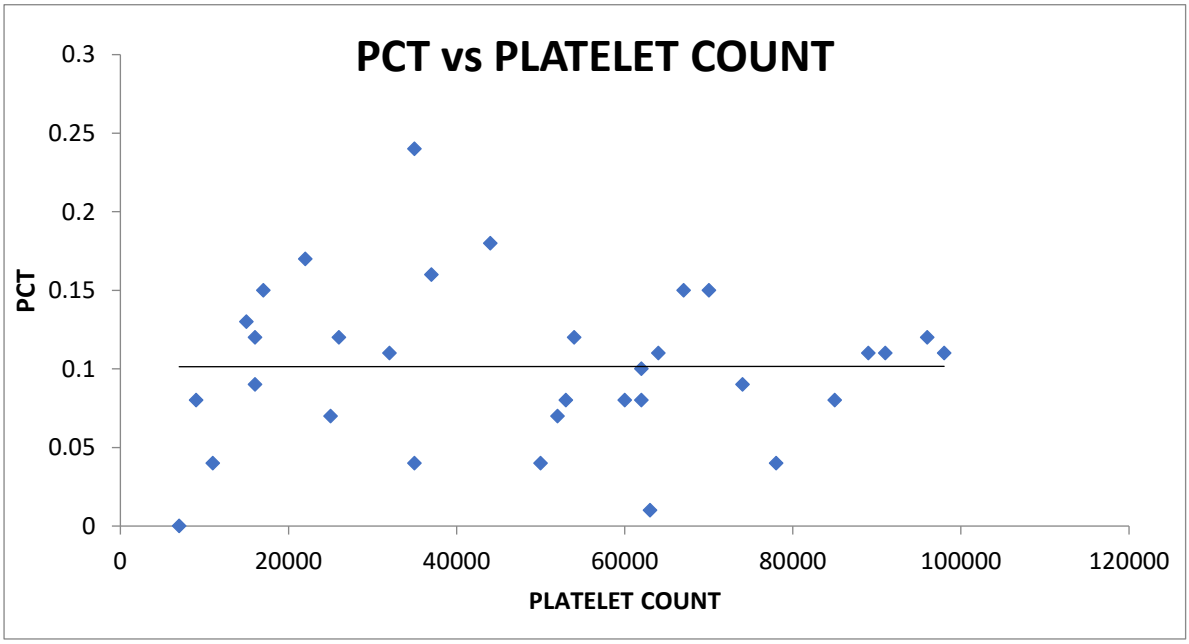

Figure 23. Correlation of PCT with platelet count in thrombocytopenia due to decreased platelet production

(xvi) THROMBOCYTOPENIA DUE TO OTHER CAUSES

In this group, the maximum cases were seen of Acute blood loss due to trauma or any surgery (9.3%), followed by thrombocytopenia in pregnancy due to Pre- eclampsia or HELLP syndrome. The correlation of IPF%, MPV and PCT was determined with the platelet count. IPF% showed positive correlation with platelet count. (Figure 24) MPV and PCT did not show significant correlation with the platelet count. (Figure 25 &26)

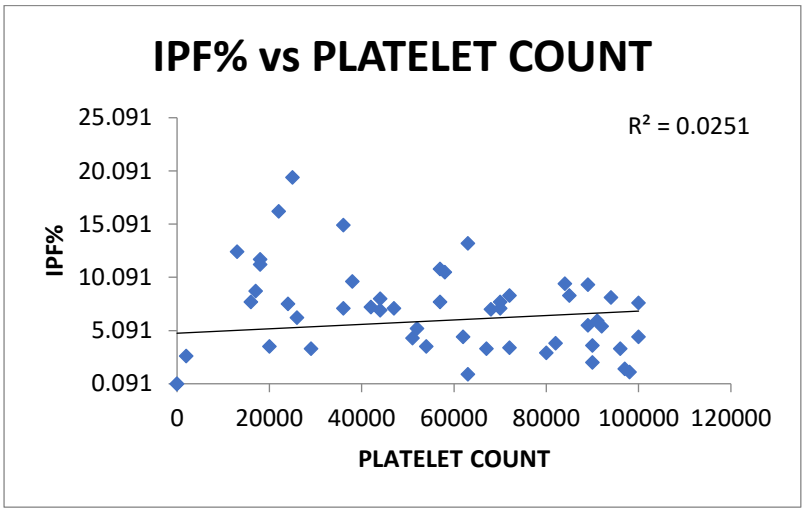

Figure 24. Correlation of IPF% with platelet count in thrombocytopenia due to other causes

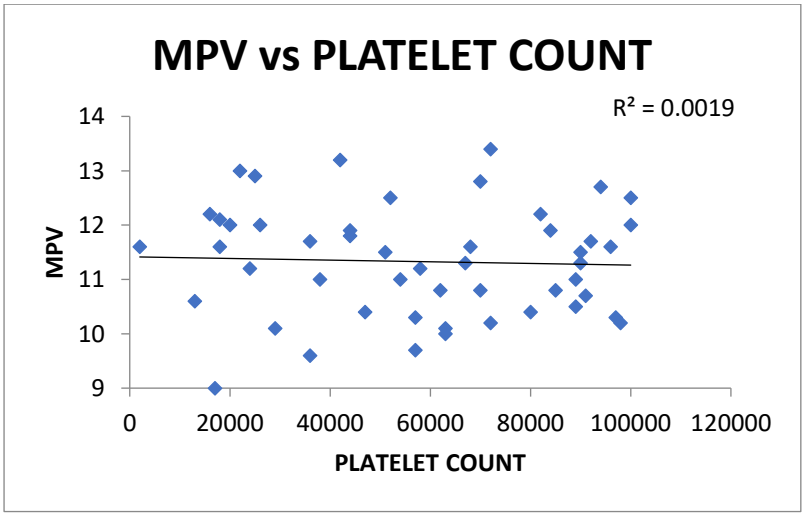

Figure 25. Correlation of MPV with platelet count in thrombocytopenia due to other causes

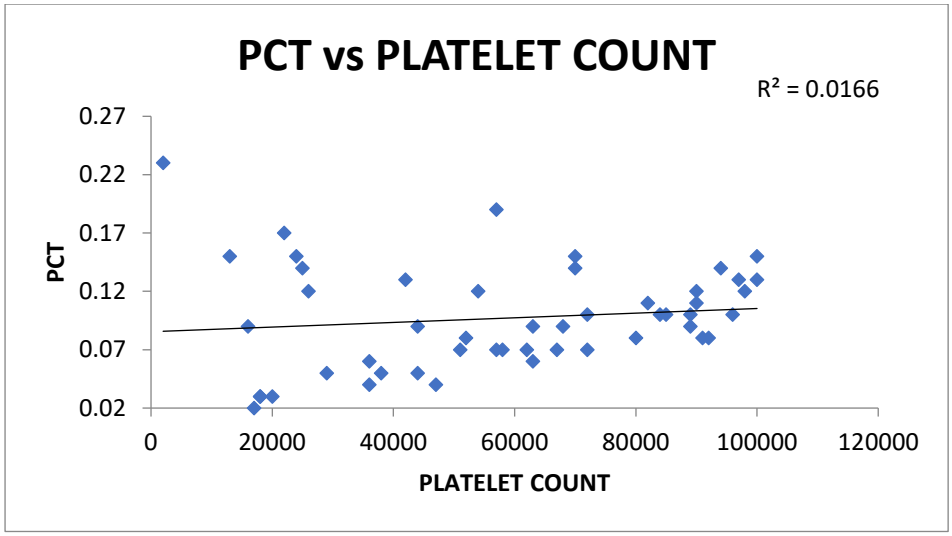

Figure 26. Correlation of PCT with platelet count in thrombocytopenia due to other causes

(xvii) CORRELATION BETWEEN IPF AND PLATELET COUNT FOR ALL CASES

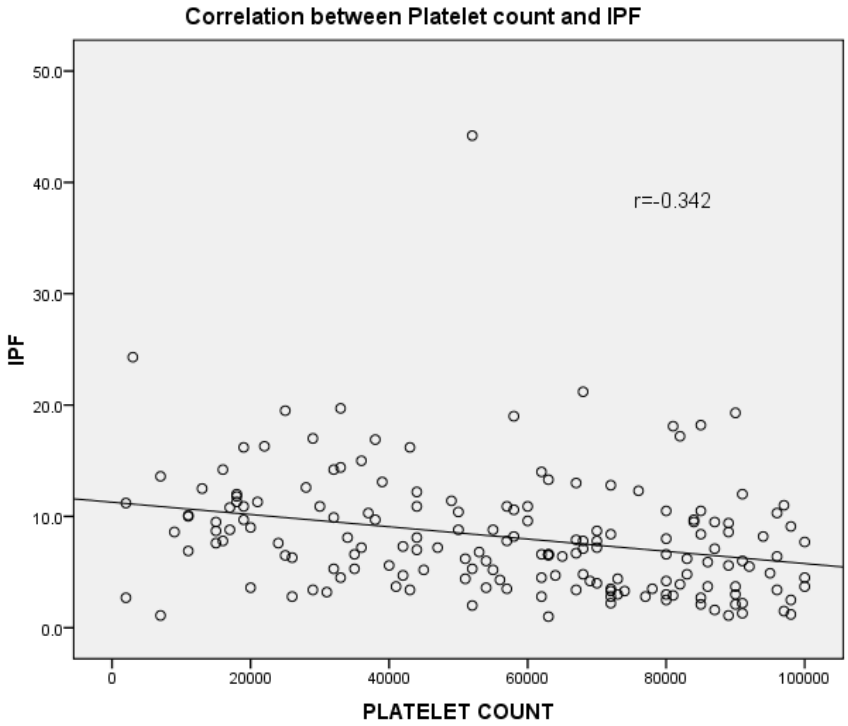

Figure 27. Scatterplot showing correlation of IPF with the platelet count in all cases

Correlation between	Spearman's Correlation coefficient	P value	Remark
Platelet count and IPF	r=-0.342	P=0.001 *	Moderate positive correlation
*Correlation is significant			

Table 8. Correlation of platelet count with IPF

Among all the cases, IPF% showed significant correlation with the platelet count (p=<0.005)

(xviii) CORRELATION BETWEEN IPF AND OTHER PARAMETERS IN ALL CASES

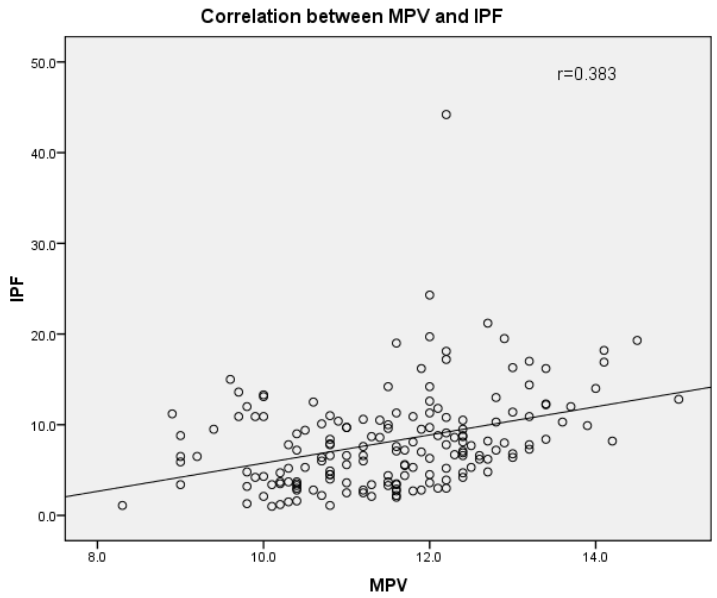

Figure 28. Correlation between MPV and IPF

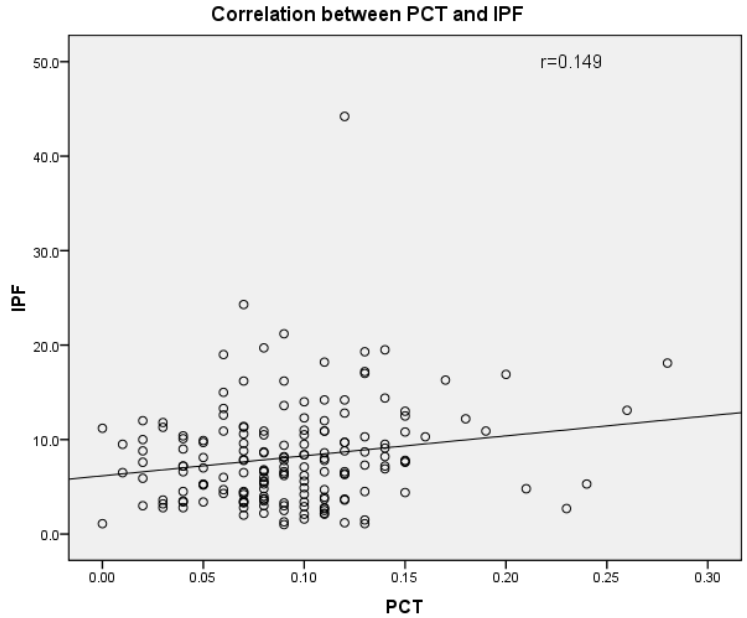

Figure 29. Correlation between PCT and IPF

In the present study, MPV and PCT showed positive correlation with IPF parameter, with p-value < 0.05

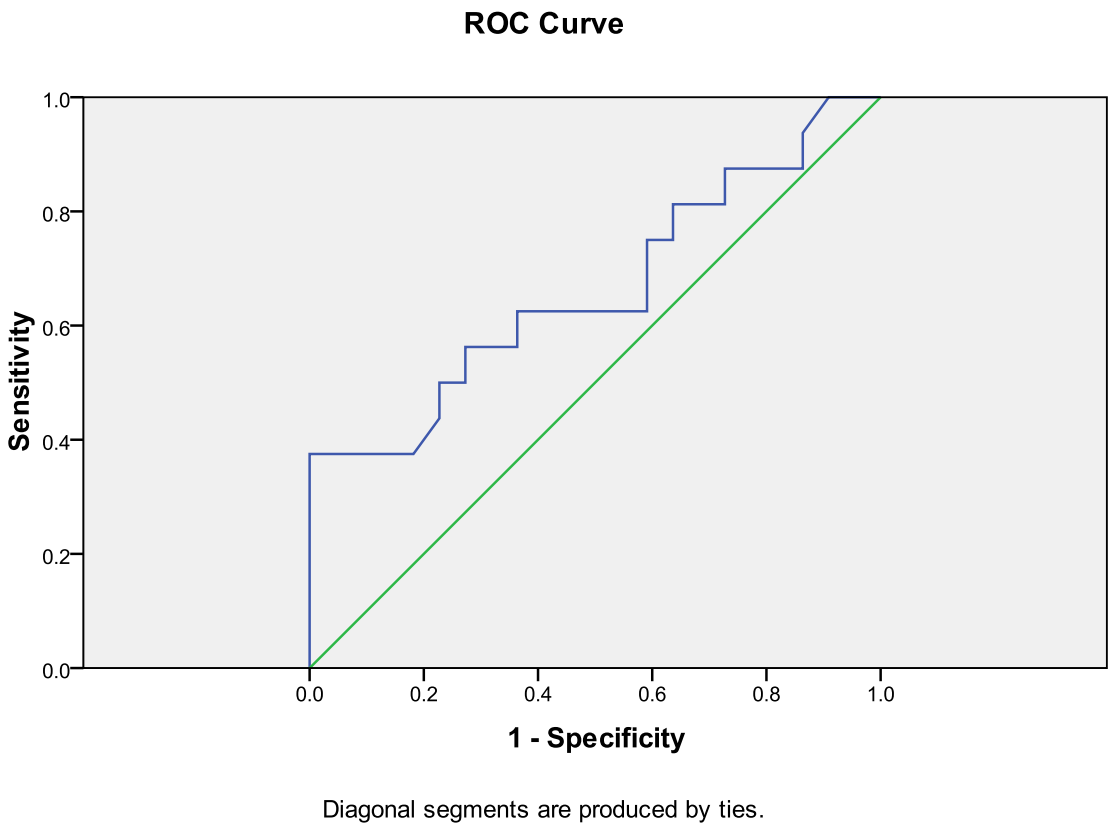

Figure 30. ROC Curve IPF% to differentiate thrombocytopenia due to increased platelet destruction and decreased platelet production.

Area under the curve- 0.66

IPF is able to differentiate between the two groups, Increased destruction of platelets and decreased platelet production with a sensitivity of 62 % and specificity of 72% at a cut off of 9.2.

All patients with IPF % > 9.2 can be categorised in the group of increased destruction of platelets and patients having thrombocytopenia due to decreased platelet production had IPF < 9.2 in majority of the cases. Thus IPF >9.2 can detect the cause of thrombocytopenia, without necessitating the need for bone marrow procedure.

DISCUSSION

Thrombocytopenia is a common ailment that can lead to fatal bleeding in severe cases. The pathogenesis of thrombocytopenia can be divided into increased destruction of platelets in the peripheral blood and decreased production of platelets in the bone marrow. Because treatment for thrombocytopenia in different conditions is different, therefore, it is very important to determine the pathogenesis in clinical practice. [29]

The parameter immature platelet fraction (IPF) is easily determined by the automated analysers and it is a useful screening test to differentiate thrombocytopenia due to decreased platelet production and increased destruction.[30] The normal range of IPF% is 1-7%.

The parameter Mean Platelet volume (MPV) represents the average volume of total platelets.[21] It reflects the changes in the rate of platelet production.[23] The parameter Plateletcrit (PCT) is a measure of total platelet mass.[31] These parameters measured by an automated haematology analyzer is a simple, rapid, inexpensive and non-invasive method, which is available in majority of diagnostic centres.[23]

Thrombocytopenia can be seen in any age group. In the present study, the youngest patient presenting with thrombocytopenia was a Day 1 baby, and oldest patient was 91 years old. The mean age being 32.7 years. (Table 1) Similarly, in a study conducted by Ferreira *et al*[32], Arshi Naz *et al*[33] the mean age was 29.1 years and 32 years respectively. In this study, the maximum number of patients were in the 20-30 years (19.8%) age group. Similar findings were seen in a study conducted by Ukey *et al*[34],Cecilia *et al*[35] and Khaleed *et al*[56] in which maximum patients were in the group 15-30, 21-30 and 15-30 years respectively.

In the present study, slight male preponderance 59% was seen. Similar result was seen in a study conducted by Young Jin Ko *et al*[36].

The cases were divided into four groups based on the aetiology of thrombocytopenia as, Decreased platelet production, Increased platelet destruction, Increased sequestration and Dilution. The maximum number of cases were seen in group comprising of cases having thrombocytopenia due to Increased platelet destruction (52.3%). In the group comprising of patients having thrombocytopenia due to decreased production of platelets, the maximum number of patients had Iron deficiency anemia or Vitamin B 12 deficiency comprising 8.1 % of the study population.

In the group of thrombocytopenia due to increased destruction, the mean Platelet count was 59204.5/µL. (Table 4) In a study conducted by Gabriele *et al*[14] and Sarah *et al*[15],the mean Platelet count was 27900/µL and 44000/µL respectively.

In the group of thrombocytopenia due to decreased platelet production, the mean Platelet count was 48939.39/µL. (Table 4) In a similar study conducted by Amira Abdel *et al*[39],the mean platelet count was 30000/µL.

In this study, the mean IPF% was found to be 9.38 in the group comprising of thrombocytopenia due to increased platelet destruction, similar findings were seen in study conducted by Jung H *et al*[41] with the mean IPF being 7.7. However, in other studies by Amira Abdel *et al*[39], Rori Indras puspita *et* al[40], Ferreira *et al*[32] ,Monteagudo *et al*[12] and Sobia Ashraf *et al*[43] the IPF values were found to be higher. (Table 5)

STUDY	Mean IPF% in increased platelet destruction	Mean IPF% in decreased platelet production
Amira Abdel *et al*[39]	11.8	7
Rori Indras Puspita *et al*[40]	11.77	7.2
Ferreira *et al*[32]	12.3	8.5
Jung H *et al*[41]	7.7	3.5
Meintker *et al*[42]	5.7	3.5
Monteagudo *et al*[12]	30.3	7.5
Sobia Ashraf *et al*[43]	14.5	8.2
Current study	**9.38**	**7.37**

Table 9. Comparison of mean IPF % in two groups

In the present study, the mean MPV was found to be 11.73 in patients having thrombocytopenia due to increased destruction of platelets and 11.30 in patients having thrombocytopenia due to decreased platelet production. Similar findings were seen in studies conducted by Amira Abdel *et al*[39], Tontanai *et al*[23] and Vani Chandrashekhar *et al*[45] ,Mikias Negash *et al* [27] and Shradha Khatri *et al* [49]. (Table 10)

STUDY	Mean MPV in increased platelet destruction	Mean MPV in decreased platelet production
Amira Abdel *et al*[39]	11.6	10.5
Tontanai *et al*[23]	8.8	7.2
Vani Chandrashekhar *et al*[31]	12.42	8.3
Mikias Negash *et al*[27]	11.8	9.7
Current study	**11.73**	**11.30**

Table 10. Comparison of MPV in thrombocytopenia due to increased platelet destruction and decreased platelet production

In this study, the mean PCT was 0.093 in thrombocytopenia due to increased platelet destruction and 0.097 in thrombocytopenia due to decreased platelet production. Similar findings were seen in studies done by Amira Abdel *et al*[39],Vani Chandrashekhar *et al*[31] and Parveen *et al* [55].

STUDY	Mean PCT in increased platelet destruction	Mean PCT in decreased platelet production
Amira Abdel *et al*[39]	0.1	0.2
Vani Chandrashekhar *et al*[31]	0.09	0.50
Parveen *et al* [55]	0.06	0.08
Current study	**0.093**	**0.097**

Table 11. Comparison of PCT in thrombocytopenia due to increased platelet destruction and decreased platelet survival

In this study, we found that IPF% showed an inverse corelation with the platelet count in all patients. (Figure 12). Similar findings were seen in studies conducted by Arshi Naz *et al*[33],Sobia Ashraf *et al*[43], Cremer *et al*[48] and Saigo *et al* [53] who determined that there is significant inverse correlation of platelet count with IPF%, the lower the platelet count, higher is the IPF%. The IPF% value reflects the severity of destruction of platelets and it has the ability to assess thrombopoietic activity. These findings were similar to a study conducted by Seo *et al* [51].

In this study, it is seen that, IPF% among other parameters has a better discriminatory power to determine the underlying cause of thrombocytopenia. Similar findings were seen in a study conducted by Kibum Jeon *et al* [50]. The IPF% is markedly raised in patients having thrombocytopenia due to increased platelet destruction than thrombocytopenia due to decreased platelet production.

With the ROC curve analysis, we got the IPF% cut off value of 9.2 to differentiate thrombocytopenia due to decreased platelet production and increased platelet destruction with sensitivity of 62% and specificity of 72%. In a study conducted by Monteagudo *et al*[12] the cut off value of IPF% was found to be >11.08% which had good sensitivity and specificity for diagnosis of thrombocytopenia. In a study conducted by Arshi Naz *et al*[33], the sensitivity of IPF% as biomarker was 85.71% and specificity was 41.76%. Adly AA *et al*[39] also reported similar data but with a sensitivity of 88% and a specificity of 85.7%.

CONCLUSION

In the present study, it is concluded that Immature Platelet Fraction (IPF%), Mean Platelet Volume (MPV) and Plateletcrit (PCT) help to differentiate thrombocytopenia due to decreased production or increased destruction. IPF% is found to be a better marker among the other parameters considered in this study. It was found that IPF% showed significant correlation with the platelet count in thrombocytopenia due to increased destruction of platelets, decreased production of platelets and in thrombocytopenia due to other causes as well. Thus, indicating that it is a good parameter to assess megakaryopoiesis activity. MPV and PCT showed a positive correlation with IPF% ($p < 0.05$) suggesting that they can be considered as a surrogate marker of megakaryopoiesis activity. The measurement of these parameters is simple, rapid and non-invasive and can be used to monitor patient's response. So, the invasive procedure of bone marrow aspiration and biopsy can be avoided.

SUMMARY

In the present study 172 cases of thrombocytopenia were studied, who presented to Department of Pathology of Shri. B. M. Patil Medical College, Hospital and Research Centre, Vijayapura from 1st December 2018 to 30th May 2020. Among 172 patients, 121 were adults and 51 were children. Males were 102 and females were 70.

These patients were divided into two groups, thrombocytopenia due to Decreased Platelet production (32 cases) and Increased platelet destruction (90 cases). There were no cases of Increased Sequestration and Dilution. Comparison of each parameter IPF%, MPV and PCT was done between two groups.

Thrombocytopenia due to other causes (50 cases) was analysed separately. Correlation of IPF%, MPV and PCT was done with platelet count in these cases.

It was found that IPF is higher in thrombocytopenia due to increased platelet destruction than thrombocytopenia due to decreased platelet production. MPV & PCT were also higher in thrombocytopenia due to increased platelet destruction. The parameter IPF% is a better marker than MPV & PCT and is able to differentiate between first two groups with a sensitivity of 62% and specificity of 72% at the cut off of 9.2.

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ANNEXURE I

B.L.D.E (Deemed to be University)
SHRI.B.M.PATIL MEDICAL COLLEGE HOSPITAL & RESEARCH CENTRE
VIJAYAPUR – 586103

IEC/NO: 286/2018
17-11-2018

INSTITUTIONAL ETHICAL COMMITTEE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this college met on 13-11-2018 at 03-15 PM scrutinize the Synopsis of Postgraduate Students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has accorded Ethical Clearance.

Title : Role of immature platelet fraction in evaluation of patients having thrombocytopenia.

Name of P.G. Student : Dr Bithika Dey.
Department of Pathology.

Name of Guide/Co-investigator: Dr.Mahesh.H.Karigoudar, Professor of Pathology.

DR RAGHAVENDRA KULKARNI
CHAIRMAN
Institutional Ethical Committee
BLDEU's Shri B.M. Patil
Medical College,BIJAPUR-586103.

Following documents were placed before E.C. for Scrutinization:

1) Copy of Synopsis/Research Project
2) Copy of informed consent form.
3) Any other relevant documents.

ANNEXURE II

BLDE
(DEEMED TO BE UNIVERSITY)
Declared as Deemed-to-be-University u/s 3 of UGC Act, 1956
The Constituent College
SHRI. B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

BLDE(DU)/REG/PG-Guide/2020-21/ 674 July 11, 2020

To,
The Professor and HOD
Department of Pathology,
BLDE (DU)'s Shri B. M. Patil Medical College,
Hospital and Research Centre,
Vijayapura

Madam,

Sub: Regarding change of PG Guide.
Ref: Your letter no. Path/2020/530 dated 1st July, 2020.

With reference to the subject and letter cited above, on approval of the Hon'ble Vice-Chancellor, the change of PG Guide is permitted in respect of PG Student of your department as per below:

Sl. No.	Name of the Student	Previous Guide	New Guide	Batch/ Year
1.	Dr. Sohan Rao	Dr. Mahesh Karigoudar	Dr. R. M.Potekar	2018-19
2.	Dr. Bithika Dey	Dr. Mahesh Karigoudar	Dr. Surekha B. Hipparagi	2018-19
3.	Dr. Saswati S.	Dr. Mahesh Karigoudar	Dr. R. M. Potekar	2019-20

This is for your information and needful.

REGISTRAR
REGISTRAR
BLDE (Deemed to be University)
Vijayapura-586103. Karnataka

Copy to:
- The Dean, Faculty of Medicine and Principal
- The Controller of Examinations
- The Concerned PG Teacher

Smt. Bangaramma Sajjan Campus, Sholapur Road, Vijayapura – 586103, Karnataka, India.
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ANNEXURE III

INFORMED CONSENT FOR PARTICIPATION IN DISSERTATION/RESEARCH

I, the undersigned,_____ ,S/O D/O W/O _____,aged____years, ordinarily resident of _____do hereby state/declare that Dr. _____

of _____ Hospital has examined me thoroughly on _____ at _____ (place) and it has been explained to me in my own language that I am suffering from _____ disease (condition) and this disease/condition mimic following diseases . Further Doctor informed me that he/she is conducting dissertation/research titled _____under the guidance of Dr _____requesting my participation in the study. Apart from routine treatment procedure, the pre-operative, operative, post-operative and follow-up observations will be utilized for the study as reference data.

Doctor has also informed me that during conduct of this procedure like adverse results may be encountered. Among the above complications most of them are treatable but are not anticipated hence there is chance of aggravation of my condition and in rare circumstances it may prove fatal in spite of anticipated diagnosis and best treatment made available. Further Doctor has informed me that my participation in this study help in evaluation of the results of the study which is useful reference to treatment of other similar cases in near future, and also I may be benefited in getting relieved of suffering or cure of the disease I am suffering.

The Doctor has also informed me that information given by me, observations made/ photographs/ video graphs taken upon me by the investigator will be kept secret and not assessed by the person other than me or my legal hirer except for academic purposes.

The Doctor did inform me that though my participation is purely voluntary, based on information given by me, I can ask any clarification during the course of treatment / study related

to diagnosis, procedure of treatment, result of treatment or prognosis. At the same time I have been informed that I can withdraw from my participation in this study at any time if I want or the investigator can terminate me from the study at any time from the study but not the procedure of treatment and follow-up unless I request to be discharged.

After understanding the nature of dissertation or research, diagnosis made, mode of treatment, I the undersigned Shri/Smt _____ under my full conscious state of mind agree to participate in the said research/dissertation.

Signature of patient:

Signature of doctor:

Witness: 1.

2.

Date:

Place

ANNEXURE IV

PROFORMA

NAME :- AGE:-

SEX:- OCCUPATION:-

RESIDENTIAL ADDRESS:-

CONTACT NO:-

OPD/IPD NO:-

CHIEF COMPLAINTS:-

PAST HISTORY:-

PERSONAL HISTORY:-

FAMILY HISTORY:-

TREATMENT HISTORY:-

CLINICAL FINDINGS:-

GENERAL PHYSICAL EXAMINATION:-

Pallor

Icterus

Clubbing

Lymphadenopathy

Edema

VITALS:-

Pulse rate Respiratory rate

Blood pressure Temperature

SYSTEMIC EXAMINATION:-

Cardiovascular system-

Respiratory system-

Per abdomen-

Spleen

Liver

Central Nervous System-

LABORATORY INVESTI-GATIONS:-	
HEMOGLOBIN (Hb)	
RED BLOOD CELL COUNT (RBC)	
WHITE BLOOD CEL COUNT (WBC)	
WBC DIFFERENTIAL COUNT (DC)	
MEAN CORPUSCULAR VOLUME (MCV)	
MEAN CORPUSCULAR HE-MOGLOBIN (MCH)	
MEAN CORPUSCULAR HE-MOGLOBIN CONCENTRA-TION (MCHC)	

HEMATOCRIT (HCT)	
PLATELET COUNT (PLT)	
MEAN PLATELET VOLUME (MPV)	
IMMATURE PLATELET FRACTION (IPF %)	
PLATELETCRIT (PCT)	
RED CELL DISTRIBUTION WIDTH (RDW)	
MICROSCOPY FINDINGS (PERIPHERAL SMEAR)	
SPECIAL INVESTIGATIONS (if any)	

KEY TO MASTER CHART

M	Male
F	Female
NCNC	Normocytic normochromic
MCHC	Microcytic Hypochromic
VF	Viral fever
AKI	Acute Kidney Injury
CKD	Chronic Kidney Disease
DP	Dengue Positive
CA	Carcinoma
IDA	Iron Deficiency Anemia
TBP	Thrombocytopenia
HEP	Hepatitis
CCF	Congestive cardiac failure
ALL	Acute lymphoblastic leukemia
MA	Megaloblastic anemia
RF	Ricketssial Fever
APH	Antepartum hemorrhage
TH	Thalassemia
HTN	Hypertension
DKA	Diabetic Ketoacidosis
TB	Tuberculosis
ACS	Acute coronary syndrome

MASTERCHART

Sr. No	PATIENT NAME	AGE	SEX	Lab no-	IP/OPD No-	CLINIAL DIGNO-SIS	PS FINDING	PLATE-LET COUNT	IPF	RBC COUNT	WBC COUNT	Hb	MCV	MCHC	MPV	PCT
1	Sopani	4	F	104872	16629	VF	NCNC Smear with relative lymphocy-tosis and TBP	55000	8.8	4.91	14.63	12.2	79.8	31.1	12.4	0.07
2	Ganesh prasad	26	M	159325	26325	DP	NCNC Smear with leucopenia and TBP	30000	10.9	5.42	3.65	16.6	87.1	35.2	13.2	0.06
3	Anusha Mahantesh Hiremath	18	F	159317	26532	DP	NCNC Smear with leucopenia and TBP	80000	2.5	4.49	2.08	12.4	84.4	32.7	11.2	0.09
4	Samarth	5	M	159309	26459	DP	NCNC Anemia with neutropenic leuco-penia and TBP	55000	5.2	4.02	3.11	10.9	79.6	34.1	10.3	0.05
5	Manjunath Krishna Vidhate	23	M	159312	26597	DP	NCNC Smear with TBP	43000	16.2	4.71	6.09	14.4	86.4	35.4	13.4	0.07
6	Manjunath Aravind Donnur	19	M	159315	26612	DP	NCNC Smear with neutropenic leuco-penia and TBP	34000	8.1	5.33	3.19	17.5	93.4	35.1	12.4	0.05
7	B/o Bhaygyashree Somanath	D 5	F	159320	25959	Preterm	Macrocytic Smear with relative neutro-philia and TBP	80000	6.6	4.99	9.46	17.5	102.8	34.1	10.8	0.12
8	Ravindra Ramarao	60	M	159326	26621	DP	NCNC Smear with leucopenia and TBP	11000	10	4.26	3.34	13.8	89	36.4	11.5	0.02
9	Mahadevi Ratanappa	55	F	104870	17268	IDA	Pan(MCHC An)	54000	3.6	3.42	1.32	6.8	73.1	27.2	11	0.12
10	Shobha Manjunath Madar	20	F	104871	16608	AKI	NCNC Anemia with leucocytosis and TBP	53000	6.8	2.72	13.64	7.9	88.2	32.9	13	0.08
11	Banu Shiva Vagare	9	F	89840	14263	ITP	NCNC Anemia with relative lymphocy-tosis and TBP	52000	44.2	3.77	5.14	11	89.4	32.6	12.2	0.12
12	Dharmanna Ra-manna Banni	80	M	153293	25683	RTA	NCNC Anemia with neutrophilic leuco-cytosis and TBP	40000	5.6	3.98	12.93	11.5	86.7	33.3	11.7	0.08
13	Ambawwa Ra-manna Sawkar	78	F	132442	21690	CKD	Macrocytic Smear with TBP	63000	6.6	3.67	7.37	11.9	100.5	32.2	12.4	0.11
14	Rajugouda Ninganagouda Patil	16	M	153483	25350	DP	NCNC Smear with leucopenia and TBP	87000	1.6	5.5	2.21	14.4	83.3	31.4	10.4	0.1
15	Soujanya Shashikant Hatture	20	F	132189	21969	DP	NCNC Smear with lymphopenia leuco-penia and TBP	62000	2.8	4.31	3.36	12.7	87	33.9	10.6	0.07
16	Bibifatima Sikan-dar	26	F	224165	37997	AKI	NCNC Smear with neutrophilia and TBP	62000	14	3.83	9.47	12.3	93.7	34.3	14	0.1
17	Arjun Prakash Shahpur	1	M	224189	37355	HEP	MCHC Anemia with neutrophilic leu-cocytosis and TBP	28000	12.6	3.16	17.37	7.5	72.5	32.8	12	0.06
18	Mallikarjun Ashokgauda Patil	14	M	224176	38133	DP	NCNC Smear with neutropenic leuco-penia and TBP	67000	7.9	5.31	3.79	13.8	76.6	33.9	10.8	0.07
19	Aryan Prakash Rathod	3	M	224158	38139	Rickets	MCHC Anemia with leucocytosis and TBP	26000	6.3	5.74	11.97	10.4	57.8	31.3	12	0.12
20	Akash Kantappa Hanchanal	20	M	224067	38079	MA	MA with TBP	15000	8.7	1.45	7.53	5.4	130.3	28.6	12.4	0.13
21	Chatrubai Ramesh Kshatri	35	F	224163	38044	Snake bite	NCNC Anemia with neutrophilic leuco-cytosis and TBP	38000	9.7	3.65	43.81	10.4	89	32	11	0.05
22	Mallikaji Shara-nappa Chimmalagi	42	M	224100	37885	MA	NCNC Anemia with lymphopenic leu-copenia and TBP	62000	6.6	2.3	3.39	8.1	99.6	35.4	11	0.08

23	Ambanna Balesh Shambewad	3	M	224115	37901	DP	NCNC Smear with relative lymphocytosis and TBP	80000	4.2	5.05	5.04	13.4	80.2	33.1	12.4	0.1
24	Sharanabasu Siddappa Gurikar	12	M	224118	37856	Viral HEP	NCNC Smear with relative lymphocytosis and TBP	20000	9	4.7	5.03	14.3	88.7	34.3	10.4	0.04
25	Vishal Chandrakant Patil	21	M	223488	37291	DP	Macrocytic Smear with neutropenic leucopenia and TBP	73000	4.4	3.01	3.49	12.2	115.9	35	11.7	0.15
26	Renuka Ramesh Harijan	21	F	223379	37645	DP	NCNC Anemia with TBP	76000	12.3	3.84	5.67	10.8	85.7	32.8	13.4	0.1
27	Jayashree Naganath Shindhe	35	F	223477	37678	PPH	NCNC Anemia with neutrophilic leucocytosis and TBP	52000	5.3	2.59	11.62	7.5	85.7	33.8	12.5	0.08
28	B/O Pooja	D 5	M	223480	37400	Preterm	Macrocytic Smear with relative neutrophilia and TBP	3000	24.3	4.42	7.28	17.8	121.5	33.1	12	0.07
29	Bharat Madusingh Rajpurohit	18	M	223486	37460	DP	NCNC Smear with relative lymphocytosis and TBP	32000	9.9	4.57	4.17	15.4	98.5	34.2	13.9	0.05
30	Sunita Nanu Rathod	38	F	223484	37396	DP	NCNC Smear with TBP	70000	4	4.51	9.78	13	86.3	33.4	10.8	0.08
31	Nabi Mainuddin Sandagi	17	M	223427	37701	VF	NCNC Smear with TBP	87000	7.1	4.68	7.5	15.1	96.4	33.5	12.4	0.1
32	Yallaling Siddappa Gurikar	6	M	223380	37855	DP	NCNC Smear with relative lymphocytosis and TBP	33000	4.5	5.2	4.69	15.3	85.8	34.3	10.8	0.04
33	Varshini Shivanand Walikar	3	F	223155	37507	VF	MCHC Anemia with TBP	44000	10.9	3.85	6.74	8.9	71.7	32.2	9.9	0.11
34	Venkatesh Sitaram kulkarni	91	M	221083	36612	CA	NCNC Anemia with TBP	89000	8.6	3.45	6.28	10.4	86.4	34.9	12.3	0.11
35	Prakash Chidananda Nad	26	M	220782	37261	DP	NCNC Smear with neutropenic leucopenia and TBP	15000	7.6	5.08	2.39	14.9	84.3	34.8	11.6	0.02
36	Maruti Shivaji Kadam	32	M	220941	37201	RTA	NCNC Smear with relative lymphocytosis and TBP	18000	11.8	4.05	5.7	13.4	96	34.4	12.1	0.03
37	Kencharay parasappa	22	M	220895	37150	Fever	NCNC Smear with relative lymphocytosis and TBP	80000	8	3.96	7.38	12.4	94.4	33.2	12.9	0.11
38	Shrishail Bhimaraya Shirasagi	50	M	220954	37049	RF	Macrocytic Smear with neutrophilic leucocytosis and TBP	85000	18.2	3.34	11.51	12.2	106.6	34.3	14.1	0.11
39	Ismail abdulsab More	45	M	221021	37311	RF	NCNC Smear with neutrophilia and TBP	70000	8.7	4.02	9.61	13.3	98.3	33.7	11.3	0.08
40	Vinay kumar Avat Sharma	35	M	221026	37299	DP	NCNC Smear with relative lymphocytosis and TBP	58000	8.2	4.04	4.39	13.2	94.6	34.6	14.2	0.09
41	Shravani Bhimappa Akkihuggi	19	F	222212	37689	VF	NCNC Smear with eosinophilia and TBP	56000	4.3	4.49	7.01	11.5	78.4	32.7	10	0.06
42	Vishal bharat Koli	16	M	221931	37489	DP	NCNC Smear with relative lymphocytosis and TBP	63000	6.6	4.72	6.29	15.1	92.4	34.6	12.6	0.09
43	Yuvraj Chandrashekhar Chavan	4	M	243875	42030	TH	Pan (Dimorphic An)	60000	10.9	2.29	3.19	5	72.1	30.3	10	0.08
44	Bouramma	62	F	243893	42112	HTN	NCNC Smear with TBP	90000	2.1	4.42	7.2	12.8	83.9	34.5	11.3	0.11
45	Lalita	34	F	243751	41662	VF	NCNC Anemia with TBP	60000	9.6	4.12	8.06	10.3	76.9	32.5	11.5	0.07
46	Vidyashree Ningappa Jatti	12	F	243873	42041	HEP	NCNC Smear with relative lymphocytosis and TBP	31000	3.2	5.23	4.01	13	76.7	32.4	9.8	0.03
47	Dhanalaxmi Bhimanna Karajagi	2	F	243817	41567	DP	NCNC Anemia with relative lymphocytosis and TBP	69000	4.2	4.78	8.37	11.2	72.4	32.4	9.9	0.07

48	Siddanna Gundappa Murade	41	M	243861	41964	Snake bite	MA with neutrophilia and TBP	67000	3.4	1.88	11.1	7.3	108	36	11.3	0.07
49	Sattyawwa Ramappa Halagani	65	F	243816	41818	DP	NCNC Smear with TBP	49000	11.4	4.76	7.21	13.2	86.1	32.2	13	0.07
50	Laxman Shivan-ingappa Sanake	38	M	243814	41707	RTA	NCNC Anemia with TBP	82000	3.9	1.48	7.18	4.7	89.2	35.6	12.2	0.11
51	Iranna Shiva-putappa Narasanagi	34	M	243828	42088	VF	MCHC Anemia with relative lympho-cytosis and TBP	43000	3.4	6.6	5.48	12.3	60.9	30.6	9	0.04
52	Jyothi Subut Gupta	34	F	242629	41864	DP	NCNC Anemia with leucocytosis and TBP	18000	12	4.15	12.53	10.8	81	32.1	9.8	0.02
53	Madarsab Ra-jahmed Landage	13	M	243880	42079	Fever	NCNC Anemia with TBP	77000	2.8	4.23	8.91	10.5	77.3	32.1	11.9	0.11
54	Mahadev Baman-ingappa Jevoor	85	M	243898	41503	DP	MA with relative neutrophilia and TBP	33000	19.7	2.64	5.04	9.9	109.1	34.4	12	0.08
55	Sunil Babu chavan	23	M	243698	41987	DP	NCNC Smear with leucopenia and TBP	42000	4.7	5.75	3.06	16.8	87.8	33.3	12.4	0.06
56	Rakesh Bagappa Dodamani	22	M	243602	41733	VF	NCNC Smear with neutropenic leuco-penia and TBP	65000	6.4	4.49	3.41	13.5	88.6	33.9	13	0.09
57	B/O Kasturi Baddu Chavan	D 2	F	243839	42089	Preterm	Macrocytic Smear with TBP	41000	3.7	5.3	12.85	17.1	95.7	33.7	10.2	0.08
58	Ramesh Chandappa Waba	36	M	243860	41070	HIVPOSI-TIVE	NCNC Anemia with TBP	11000	6.9	3.01	4.71	8.8	89	32.8	12.4	0.14
59	Mallamma	85	F	231696	413592	DP	NCNC Anemia with neutrophilic leuco-cytosis and TBP	68000	4.8	3.46	13.83	9.9	88.2	32.5	12.7	0.08
60	Laxmi Raju Mad-awwar	26	F	230884	42323	RF	Normocytic normochomic Smear with TBP	89000	1.1	4.33	6.33	11.2	77.6	33.3	10.8	0.13
61	Bharati Vijaya-kumar Ankaqlagi	50	F	232447	42174	Pan	Pan (Microcytic hypochromic Anemia)	67000	13	3.78	3.22	7.8	75.4	27.4	12.8	0.15
62	Ravatappa Mara-tand Wagger	17	M	223222	41018	VF	MCHC Anemia with leucocytosis and TBP	19000	9.7	6.04	12.76	10	68.4	31.5	11	0.12
63	Motabai Tukaram Chawan	50	F	233091	42376	DP	MCHC Anemia with leucocytosis and TBP	86000	5.9	5.31	12.22	10.4	64.6	30.3	9	0.02
64	Neela Danand Jali-hal	28	F	231618	42321	APH	NCNC Anemia with neutrophilic leuco-cytosis and TBP	47000	7.2	2.81	28.7	7.8	82.6	33.6	10.4	0.04
65	Bhimappa Guralin-gappa Agasar	35	M	232373	42380	VF	NCNC Smear with neutrophilic leuco-cytosis and TBP	2000	11.2	5.55	13.01	15.8	83.6	34.1	8.9	0
66	Ramsingh Raichand Kotwal	35	M	231648	42372	VF	Macrocytic Smear with TBP	85000	2.1	4.65	4.67	15.5	103	32.4	10	0.1
67	Ranichannamma Chidanand Yalameli	5	F	231673	42445	DP	NCNC Smear with relative lymphocy-tosis and TBP	26000	2.8	4.83	5.4	12.9	81.6	32.7	11.2	0.04
68	Roopali Motisingh Chavan	12	F	223271	40912	RF	NCNC Anemia with leucocytosis and TBP	72000	12.8	3.71	12.78	10.3	88.4	31.4	15	0.12
69	Arun Shankar Nayak	10	M	223559	41022	VF	NCNC Smear with relative lymphocy-tosis and TBP	81000	2.9	5.16	6.08	12.9	78.5	31.9	11.6	0.1
70	Shreedevi Shridhar Hamitkhane	60	F	223967	41162	DKA	NCNC An neutrophilic leucocytosis and TBP	36000	7.2	3.78	18.44	10.1	80.7	33.1	11.7	0.04
71	Bharatsingh Vittal Mithade	50	M	225426	41330	ALD	Macrocytic Smear with TBP	52000	2	3.7	7.48	13.4	103.2	35.1	11.6	0.07

72	Sunanda Ningayya Anachimath	44	F	225450	41544	Chikungu-nya	NCNC Smear with relative neutrophilia and TBP	73000	3	3.81	8.04	11.2	87.9	33.4	12.1	0.09
73	Kavya Shivanand Chalawadi	19	F	67242	13346	MA	Pan (NCNC Anemia)	22000	16.3	2.41	4.7	8.3	93.8	36.7	13	0.17
74	Sangappa Golappa Chitaragi	55	M	64060	13005	Gangrene	Pan (NCNC Anemia)	2000	2.7	2.27	2.11	6.3	81.9	33.9	11.6	0.23
75	Abhishek Bhi-mashankar Majjagi	13	M	64046	12785	DP	Pan (MA)	72000	3.3	2.23	2.44	8	102.2	35.1	10.4	0.07
76	Tarabai Dhana-singh Jadhav	60	F	64041	13001	AKI	NCNC Anemia with neutrophilia and TBP	20000	3.6	2.4	5.45	7.4	91.3	33.8	12	0.03
77	Devendra Shivangouda Ko-lageei	45	M	63950	13019	Malaria	MCHC Anemia with neutrophilia TBP	21000	11.3	2.59	5.35	4.5	63.3	27.4	12	0.07
78	Raju Ravaji Ghorpade	42	M	67389	13814	GI Bleed-ing	Pan (MA)	18000	11.3	0.96	1.52	3.9	109.4	37.1	11.6	0.03
79	Shruti Anilkumar	25	F	67805	13912	Post LSCS	NCNC Anemia with neutrophilic leuco-cytosis and TBP	72000	3.5	2.52	25	7.6	84.5	35.7	10.2	0.07
80	Santosh Shiy-ogeppa	36	M	67804	13906	TB	NCNC Anemia with leucopenia and TBP	74000	3.3	1.89	2.91	5.8	98.4	31.2	11.5	0.09
81	Omkareshwar Gan-geyya	2	M	67840	13877	Fracture	NCNC Anemia with relative neutro-philia and TBP	63000	13.3	4.26	8.27	10.7	74.6	33.6	10	0.06
82	Asif Saifanasab Mira	37	M	67104	13501	CKD	NCNC Anemia with relative neutro-philia and TBP	83000	6.2	2.09	5.48	7	97.6	34.3	12.6	0.1
83	Vilas Ramachandra Babaladakar	54	M	65441	13407	Cellulitis	Pan (MCHC Anemia)	15000	9.5	2.12	3	4.1	68.9	28.1	9.4	0.01
84	Pandappa Neelappa Chinnavar	58	M	66130	13527	HEP C	NCNC Anemia with TBP	45000	5.2	2.03	7.26	5.5	87.2	31.1	12.2	0.05
85	Geeta gyanappa Hugar	41	F	66015	13293	Pan	Pan (NCNC Anemia)	7000	1.1	1.93	1.41	6.1	85	37.2	8.3	0
86	Pramod Tavaru Lamani	52	M	66129	13348	Post- Sur-gery	NCNC Anemia with neutrophilic leuco-cytosis and TBP	72000	2.2	2.92	11.21	9.1	91.1	34.2	10.7	0.08
87	Rudrappa Basappa Zen	40	M	66716	13535	ALD	NCNC Anemia with neutrophilia and TBP	9000	8.6	1.79	7.13	5.4	91.1	33.1	11.4	0.08
88	Chandrakanth Vit-toba	45	M	66826	13339	MTX	Pan (NCNC Anemia)	7000	13.6	2.78	0.53	7.6	81.7	33.5	9.7	0.09
89	Gangubai Bapu Ba-goji	73	F	66675	13512	AKI	NCNC Smear with leucocytosis and TBP	90000	19.3	3.64	13.65	12	92.3	35.7	14.5	0.13
90	B/O Mahadevi Ramesh Hire	D 1	M	66719	12751	Preterm	MA with neutrophilia and TBP	57000	10.9	2.36	15.86	7.7	91.1	35.8	9.7	0.19
91	Mahantesh Chan-nappa	32	M	66722	13284	MA	Pan (MA)	78000	3.5	2.31	2.4	8.4	110	33.1	10.4	0.04
92	B/O Fathima Man-zoorilal	D 8	M	69021	13596	HEP	NCNC Anemia with relative neutro-philia and TBP	13000	12.5	3.4	8.88	12	102.1	34.6	10.6	0.15
93	Mahalingappa Ba-salingappa	85	M	68308	14017	NSTEMI	NCNC Anemia with TBP	89000	9.4	2.12	4.6	6.1	87.7	32.8	10.5	0.09
94	Shruti Anilkumar Bhairasheti	25	F	67805	13912	PPH	NCNC Anemia with neutrophilic leuco-cytosis and TBP	36000	15	2.49	12.92	7	77.9	36.1	9.6	0.06
95	Mustafa	21	M		13989	Trauma	NCNC Smear with TBP	58000	19	5.34	7.5	15.5	85.2	34.1	11.6	0.06

96	Renuka Bhimaraya Sindagi	24	F	67986	13760	HIV	MCHC Anemia with TBP	83000	4.8	3.48	6.18	7.3	67.2	31.2	9.8	0.21
97	Dilipraj Ra-yanagouda Patil	61	M	69317	13996	Fever	MCHC Anemia with relative neutro-philia and TBP	90000	3	0.63	5.71	1.3	60.3	34.2	12.2	0.02
98	Basavaraj Kallappa	37	M	69039	14159	RTA	NCNC Smear with neutrophilic leuco-cytosis and TBP	80000	3	4.12	11.98	13.1	92.2	34.5	10.4	0.08
99	Neelamma Gu-rusangappa	61	F	69038	13795	Post- sur-gery	NCNC Anemia with relative neutro-philia and TBP	72000	8.4	2.42	10.12	7.5	95.9	32.3	13.4	0.1
100	B/o Sadiya Mdamanulla	D 8	M	69037	13649	Preterm	NCNC Smear with relative neutrophilia and TBP	100000	7.7	4.36	10.49	16.4	108.5	34.7	12.5	0.15
101	Siddalingayya	37	M	68700	13940	Pericardial effusion	MCHC Anemia with relative neutro-philia and TBP	98000	1.2	5.15	6.84	10.3	64.5	31	10.2	0.12
102	B/o Shilpa Hiremath	D 10	F	68701	13716	Post- sur-gery	NCNC Smear with neutrophilic leuco-cytosis and TBP	39000	13.1	5.4	14.41	17	92.2	34.1	10	0.26
103	Bapusab Chan-dasab	76	M	68385	13477	Pneumo-nia	MA with relative neutrophilia and TBP	35000	5.3	2.08	10.11	7.1	101.9	34.8	10.5	0.24
104	Chandubai Mallan-agouda	71	F	67339	13636	Cere-broVA	NCNC Smear with neutrophilic leuco-cytosis and TBP	81000	18.1	5.2	19.05	14	84.4	31.9	12.2	0.28
105	Keerti Rajaput	24	F	69041	14170	Post lscs	Pan (NCNC Anemia)	17000	8.8	1.78	3.3	6.3	96.6	36.6	9	0.02
106	Chandrakala Ravi Tal	21	F	70608	14441	RVD posi-tive	NCNC Anemia with neutrophilic leuco-cytosis and TBP	54000	6	3.42	19.74	11.3	91.2	36.2	11.2	0.06
107	Veda Narayan Tel-agod	34	F	70609	14408	DIC	NCNC Anemia with neutrophilic leuco-cytosis and TBP	67000	6.7	1.78	14.11	5.5	87.6	35.3	12.3	0.08
108	Pratviraj jatteppa	53	M	70611	14242	Hepatic encepha-lopathy	NCNC Anemia with neutrophilic leuco-cytosis and TBP	16000	7.8	2.03	19.83	5.7	84.7	33.1	12.2	0.09
109	Shivappa	63	M	70169	14405	IHD,Dia-betes	NCNC Anemia with TBP	29000	17	3.83	10.41	11.5	83	36.2	13.2	0.13
110	Channamma	40	F	69738	14314	Appendi-citis	NCNC Smear with eosinophilia and TBP	68000	21.2	4.89	7.98	13.5	86.1	32.1	12.7	0.09
111	Nagamma Devanna Wadd	18	F	70362	14389	CKD	NCNC Anemia with neutrophilic leuco-cytosis and TBP	97000	1.5	2.81	12.63	7	76.2	32.7	10.3	0.13
112	Dhanesh Jgadevappa	9	M	70379	14449	TH	NCNC Anemia with relative lymphocy-tosis and TBP	96000	6.4	2.25	4.54	6.4	77.3	36.8	10.7	0.12
113	SidDya Karpurmath	46	M	69040	13968	MA	Pan (NCNC Anemia)	37000	10.3	2.28	2.74	8.1	99.1	35.8	12.8	0.16
114	Prashant Pattar	28	M	143158	70826	HEP	NCNC Anemia with relative lymphocy-tosis and TBP	87000	9.5	2.04	4.37	5.3	77.5	33.5	12.4	0.14
115	Aishwarya	25	F	14488	70761	PPH	NCNC Smear with TBP	44000	8.1	3.76	4.05	5.6	92	34.6	11.8	0.09
116	Jayashree	18	F	142690	71337	Infection	Pan (NCNC Anemia)	63000	6.5	1.11	1.89	3.89	98.2	34.9	9	0.01
117	Shivappa	63	M	14405	71547	VF, IHD	NCNC Anemia with mild leucocytosis and TBP	96000	10.3	3.45	11.29	10.1	84.6	34.6	13.6	0.13
118	Yamanna	60	F	14538	71601	CCF	NCNC Anemia with neutrophilic leuco-cytosis and TBP	84000	29.7	5.28	22.02	11	78	26.7	12	0.12
119	Chandu Rangappa	25	M	14541	71261	RTA	NCNC Anemia with TBP	90000	3.7	3.43	6.65	9.9	85.1	33.9	11.5	0.12
120	Sharanayya Chan-drayya	2	M	14732	71708	Marasmus	MCHC Anemia with mild leucopenia and TBP	70000	7.8	3.07	5.86	5.8	68.1	27.8	10.8	0.15
121	Vilas Babaladkar	54	M	144805	71913	An	Pan (NCNC Anemia)	35000	6.6	3.82	3.9	9.8	81.4	31.5	11.2	0.04

122	Sakshi Shrishail	6	F	14630	71888	DP	NCNC Anemia with eosinophilia and TBP	91000	1.3	3.65	7.96	10.1	76.7	36.1	9.8	0.09
123	Siddharth Ramesh	24	M	14770	71918	DP	NCNC Smear with leucopenia and TBP	91000	2.2	4.95	2.61	13.5	80.8	33.8	11.6	0.11
124	Tukaram Rathod	64	M	143282	71926	VF	MCHC Anemia with mild leucopenia and TBP	85000	2.7	5.82	4	11.5	60.3	34.2	11.8	0.11
125	Irappa Ameenappa	70	M	14494	71894	CKD	NCNC Anemia with neutrophilic leucocytosis and TBP	42000	7.3	3.26	12.04	9.4	81	35.6	13.2	0.13
126	Muskan	18	F	145148	72050	VF	Normocytic normochromic Smear with TBP	68000	7.8	4.65	10.15	12.3	76.6	34.6	13.2	0.11
127	Yallawwa	40	F	146050	72961	DIC	NCNC Anemia with neutrophilia and TBP	70000	7.2	3.56	10.08	11	90.7	34.1	12.8	0.14
128	Anilkumar	29	M	146177	72974	ALD	MCHC Anemia with TBP	85000	10.5	5.44	4.85	11.4	69.9	30	11.4	0.08
129	Aishwarya	25	F	14488	71352	Post LSCS	NCNC Anemia with TBP	51000	4.4	3.01	4.76	9	86.7	34.5	11.5	0.07
130	Ramesh Jinappa Bajantri	32	M	14807	72524	DP	NCNC Smear with TBP	50000	8.8	3.26	4.82	13.4	89.6	34.8	12.1	0.12
131	Saibab	60	M	14601	73196	ACS	NCNC Anemia with TBP	98000	19.1	3.38	7.04	8.1	80.2	29.9	12.2	0.14
132	Ruksana	20	F	15032	73214	ACS	NCNC Anemia with neutrophilic leucocytosis and TBP	44000	7	1.77	19.88	5	81.9	34.5	11.9	0.05
133	Padmanna	75	M	146556	73323	COPD	Pan (MCHC Anemia)	24000	7.6	4.62	2.14	10.9	71	33.2	11.2	0.15
134	Shankar	35	M	15186	73801	ALD	NCNC Anemia with TBP	64000	4.7	3	9.01	7.3	77	31.6	10.2	0.11
135	Ravatappa	42	M	15375	74849	RTA	Macrocytic Smear with neutrophilic leucocytosis and TBP	100000	4.5	3.83	12.84	14.5	105.7	35.8	12	0.13
136	Shivanand	4	M	15257	74534	IDA	MCHC Anemia with relative lymphocytosis and TBP	44000	12.2	1.85	6.64	4.6	75.7	32.9	13.4	0.18
137	B/o Anita	D 8	M	14710	74829	Preterm	NCNC Anemia with relative neutrophilia and TBP	38000	16.9	2.29	6.69	7.1	89.5	34.6	14.1	0.2
138	Priyanka	25	F	15117	73514	PPH	NCNC Anemia with leucocytosis and TBP	92000	5.5	4.67	12.21	11	79	29.8	11.7	0.08
139	Siddharth	24	M	14770	73610	DP	NCNC Smear with mild leucocytosis and TBP	80000	10.5	5.52	11.57	14.7	79.3	33.6	12.4	0.1
140	Buddawa	74	F	15125	73535	DP	NCNC Anemia with neutrophilic leucocytosis and TBP	86000	3.7	3.61	12.55	10.3	87	32.8	10.3	0.11
141	Kashibai	28	F	15295	74186	ALL	Pan (MA)	16000	14.2	1.52	3.36	5.7	100.7	37.3	11.5	0.12
142	Sangamma	28	F	15293	74451	MA	MA with mild leucocytosis and TBP	91000	12	1.81	11.65	6.5	101.7	35.3	13.7	0.11
143	Bhagyashree	23	F	15249	74700	Post LSCS	NCNC Anemia with neutrophilia and TBP	96000	3.4	2.32	5.46	7.4	90.9	35.1	11.6	0.1
144	Vilas	34	M	148142	74300	MA	NCNC Anemia with leucopenia and TBP	17000	10.8	3.13	3.45	8.2	79.2	33.1	12.2	0.15
145	Shoba	39	F	15270	74241	DP	MCHC Anemia with neutrophilic leucocytosis and TBP	33000	14.4	3.74	16.61	8.8	72.2	32.4	13.2	0.14
146	Roopa	6	F	15254	74081	MA	Macrocytic anema with relative lymphocytosis and TBP	29000	3.4	1.47	5.63	4	101.4	26.8	10.1	0.05
147	Laxmi Sangamesh Kambar	11	F	14566	70998	DP	NCNC Anemia with neutropenic leucopenia and TBP	100000	3.7	2.55	3.62	8.4	87.1	37.8	10.4	0.08
148	Basappa Sadashiv	43	M	14560	70995	CKD	NCNC Anemia with TBP	62000	4.5	3.29	5.09	10.4	85.4	37	10.8	0.07
149	Arati Channabasu	7	F	14569	70996	DP	NCNC Anemia with leucopenia and TBP	32000	5.3	2.46	2.21	8.3	96.3	35	11.8	0.05
150	Nagappa	60	M	15774	77653	CA	NCNC Anemia with TBP	98000	2.5	1.95	6.18	5.9	93.8	32.2	11	0.11

151	Maruti	80	M	15958	77655	ACS	MA with neutrophilia and TBP	58000	10.6	1.99	9.39	8.1	122.6	33.2	11.2	0.07
152	Mohammad arafiq Naikodi	34	M	15238	76808	Post- Surgery	NCNC Anemia with neutrophilia and TBP	89000	5.6	3.86	7.84	10.7	82.1	33.8	11	0.1
153	B/O Nagamma	D 4	M	14605	76455	Preterm	NCNC Smear with relative lymphocytosis and TBP	85000	8.4	4.61	15.27	15.7	98.3	34.7	10.8	0.1
154	Mallikarjun	34	M	15013	76459	HIV	NCNC Anemia with neutrophilic leucocytosis and TBP	57000	3.5	2.97	28.11	10	88.6	38	11.6	0.08
155	Bhirappa	70	M	15726	76659	CKD	NCNC Anemia with neutrophilia and TBP	63000	1	2.99	10.57	10.5	78.9	44.5	10.1	0.09
156	Sairabanu	18	F	15211	75663	Pan	Pan (NCNC Anemia)	32000	14.2	3.37	2.17	7.7	77.7	29.4	12	0.11
157	B/O Shweta	D 1	F	15667	76257	Preterm	Macrocytic Smear with relative neutrophilia and TBP	91000	6	4.98	9.9	18.1	119.9	30.3	10.7	0.08
158	B/O Sangamma	D 1	M	15326	76275	Preterm	Macrocytic Smear with TBP	94000	8.2	4.36	15.21	14.8	97.2	34.9	12.7	0.14
159	Praveen Neelakantayya	34	M	15306	75650	ALD	Pan (MA)	25000	6.5	1.61	2.89	5.6	100	34.8	9.2	0.07
160	Shoba	33	F	15270	75611	DP	MCHC Anemia with neutrophilic leucocytosis and TBP	82000	17.2	4.33	15.86	10.3	75.8	31.4	12.2	0.13
161	Kariyanna	45	M	15430	76108	HEP	NCNC Smear with relative lymphocytosis and TBP	19000	16.2	5.88	4.3	16.4	76.4	36.5	11.9	0.09
162	Mayawwa Shrishail	23	F	14379	70000	IDA	Pan (NCNC Anemia)	50000	10.4	1.85	2.97	5	80	33.8	10.9	0.04
163	Channappa	30	M	15490	75264	Fracture	NCNC Anemia with neutrophilia and TBP	84000	9.5	2.5	10.19	8	97.6	32.8	11.9	0.1
164	Savitri	26	F	15453	75312	Pre eclampsia	NCNC Anemia with neutrophilic leucocytosis and TBP	25000	19.5	2.65	19.94	7.3	79.6	34.6	12.9	0.14
165	Madivallappa	45	M	15303	75293	HIV	NCNC Smear with neutrophilic leucocytosis and TBP	97000	11	4.99	11.61	14.2	83.4	34.1	10.8	0.1
166	Vilas	54	M	15309	75428	TH	Pan (NCNC Anemia)	11000	10.1	3.54	2.63	9.4	80.8	32.9	10.7	0.04
167	Chandappa Ambanna	45	M	14665	71351	Fracture	NCNC Anemia with TBP	57000	7.8	3.46	6.18	8.4	76.9	31.6	10.3	0.07
168	Ambanna	45	M	16016	78034	Fever	MCHC Anemia with neutrophilic leucocytosis and TBP	72000	2.8	3.15	11.38	7.7	74.3	32.9	10.4	0.03
169	Shehnaaz	48	F	16030	78049	Infection	NCNC Anemia with neutrophilic leucocytosis and TBP	95000	4.9	3.44	19.89	9.7	80.5	35	10.8	0.1
170	Mallappa	54	M	3590	73226	Trauma	NCNC Anemia with TBP	68000	7.1	2.88	5.4	9.1	95.8	33	11.6	0.09
171	Laxmi	19	F	5158	14455	Malaria	Pan (MA)	51000	6.2	2.58	3.23	9.4	103.5	35.2	12.7	0.09
172	Ramu	45	M	3615	50132	Infection	NCNC Anemia with neutrophilic leucocytosis and TBP	19000	10.9	3.46	11.71	10.1	92.2	31.7	11.8	0.11