Evaluation of some Hematological indicators in patients with Immune Thrombocytopenia Purpura

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Abstract

Background: The term immune thrombocytopenia purpura (ITP) is an acquired hematological Autoimmune disorder, refers to A decrease in The quantity of platelets in the bloodstream caused by peripheral platelet destruction or hypo-proliferation in the bone marrow. This autoimmune disease is characterized by petechiae, bruising, nosebleeds, purpura , bleeding gums, and heavy menstrual bleeding.

Aims: The aimed the purpose of this investigation was to investigate the impact of some hematological indicators in patients who have Immune Thrombocytopenia Purpura. *Materials and method:* This work was used on 50 clinically confirmed subjects in the field of Immune Thrombocytopenia purpura of different ages, and their ages ranged from 3 to 60 years, and 50 control subjects also their ages ranged between 4 to 60 years. attended to Wasit center for treatment of malignant tumor in Al-Karama teaching hospital in period between September 2023 to march 2024. After being separated by a centrifuge, blood samples were utilized to measure hematological indicators.

Results: The current study's findings indicated that the levels of platelets, HGB , MCV, and HCT had decreased while the levels of neutrons had increased.

Conclusion Through the study it is clear that hematological indicators play a role in their effect on patients with Immune thrombocytopenia purpura (ITP), and as a result can be applied to identify and assess the illness.

Keywords: Immune thrombocytopenia purpura, ITP, Hematological Indicators, platelets.

Graphical abstract
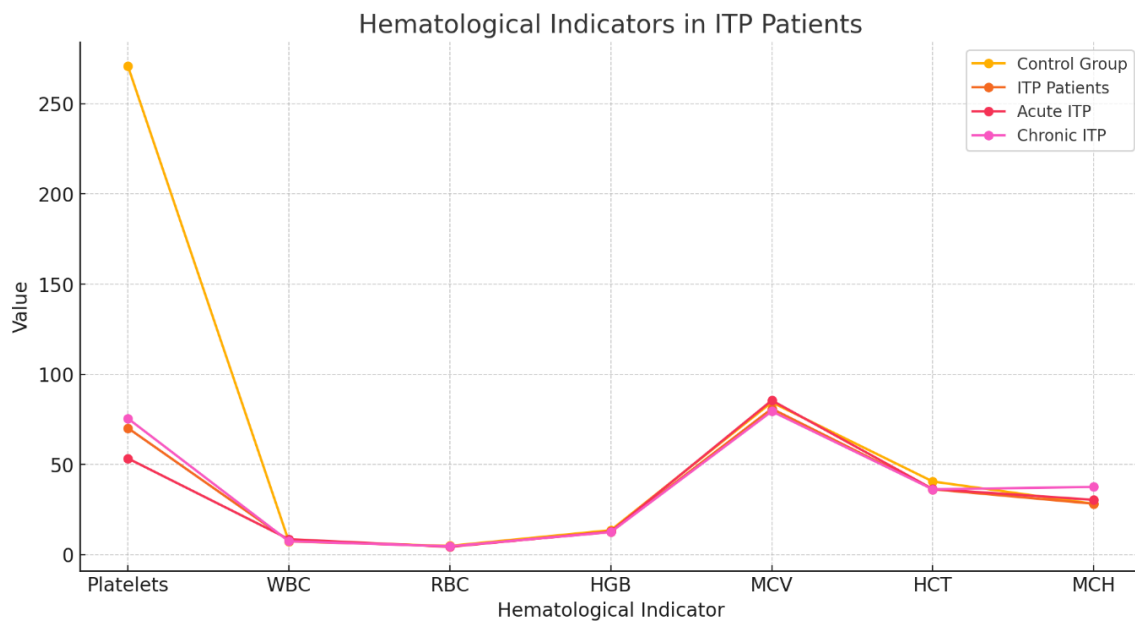
Mini-Abstract :

This graphical abstract visually represents the variations in hematological indicators among control subjects and patients with Immune Thrombocytopenia Purpura (ITP), including both acute and chronic cases. The figure highlights key differences in platelet count, WBC, RBC, and other indicators

Introduction:

An acquired hematological autoimmune disease known as immune thrombocytopenia purpura (ITP) is characterised by the formation of antiplatelet antibodies, which lead to platelets being broken down more quickly and taken out of circulation prematurely by macrophages of the reticuloendothelial system . It also prevents platelets from being produced when drugs, infections, cancer, or other autoimmune diseases influence the body.[1] These antibodies can cause platelet mortality mediated by complement or desialylation, as well as disrupt megakaryocyte function.[2] Immune Thrombocytopenia is defined as reduced The amount of platelets in the

circulating blood as a result of hypoproliferation in bone marrow or peripheral breakdown of platelets.[3] The clinical manifestations of ITP can differ according on the degree of the platelet count and the presence of any underlying medical disorders . Purpura, bruises, nosebleeds, bleeding gums, petechiae, and severe menstrual bleeding are among the most typical signs.[4] It is believed that the fundamental cause of ITP is the production of certain IgG antiplatelet autoantibodies that cause excessive platelet destruction and reduced platelet survival .[5] Moreover, ITP is divided into:Acute: typically affect 80% of patients, usually following a viral infection that is self-limited and lasts no longer than six months ,[6] Chronic: thrombocytopenia persists for more than a year, usually in elderly females .[7] ITP's immunopathogenesis is multifaceted, including several immune cell types and immunological pathways. Although the precise immunological mechanisms behind the development of ITP remain unclear, it is believed that autoantibodies, decreased platelet synthesis, T cells, B cells, and immune system dysregulation interact intricately. [8] The function of leukocyte counts and cellular indices, which can be a marker of the state of immune responses, has been examined in autoimmune illnesses, namely ITP. [9]

Materials and methods

Subjects and design study:

Blood samples were taken from Immune thrombocytopenia patients who came for the purpose of being diagnosed or receiving treatment . The study encompassed 50 patient samples (38 chronic and 12 acute) with immune thrombocytopenia purpura (ITP) , participants aged between 3 and 60 years . as well as Blood sample were taken from 50 healthy people aged from 4 to 60 years . within the limited period from September 25, 2023, to March 15, 2024 .

Sample collection:

After gathering information from patients with ITP and healthy people , having each person fill out a form , the samples were taken from the Wasit center for the treatment of malignant tumors in the Al-Karama teaching hospital. Patients receive the drawing of two millilitres of venous blood after the blood drawing location has been cleaned with cotton and 70% diluted alcohol. An EDTA tube containing 2 millilitres of whole blood was used for haematological examinations (CBC).

Statistical Analysis:

An Anova test and statistical software (SPSS 24) were used to analyse the results of the current investigation.M±SD, or mean standard deviation of the mean, was used to display the data. The study employed the Pearson connection coefficient to ascertain the statistical significance, direction, and strength of a linear link between the normally distributed patient data of individuals with immune thrombocytopenia purpura and control . All tests were considered significant if the P-value was less than 0.05 .

Results :

The table (1) of the current research showed significantly reduction in the concentration of PLT in immune thrombocytopenia patients compared with healthy controls. Mean value of PLT in all Immune thrombocytopenia   patients was (70.160±94.398) respectively. As well as control subjects' mean values were (270.86±60.660) . also , showed significantly increase in the concentration of PLT in acute patients compare to the chronic patients . the mean value of PLT in all acute patients was (53.333±92.406), while the chronic patients was (975.473±95.613) .

The current study, as shown in Table (2) , Mean value of WBC in Immune thrombocytopenia patients was (7.642±3.030A) compared to healthy subjects was (7.243±1.643A) , There was no increase or decrease in the percentage between ITP patients and control , As well as for acute and chronic patients There was very a slight increase in the concentration of white blood cells in acute ITP with percentage of (8.533±3.698) compared with chronic ITP with percentage of (7.362±2.785) .

The results of the current study showed that there was no different in the mean value between ITP patients and control croup in the concentration of LYM with percentage 2.315±1.039A) in ITP patients and (2.807±3.607A) in control group. Also there was no significantly different in ITP acute and ITP chronic patients .As for the MON , there was no different in the mean value between ITP patients and control croup (0.516±0.286a), (0.539±0.159a) . and the same goes for chronic and acute ITP (0.55±0.287A), (0.506±0.289A) .

The concentration of NEU in ITP patients and control was also slight increase in patients with percentages of (4.572±2.651A) compared with the control qroup (3.962±1.512A). and the same was for the acute and chronic ITP with percentage of (5.383±3.980A),(4.316±2.078A).

The current study's showed the concentration of RBC in patients was (4.511±0.593a) , and for control was (4.841± 0.519a) . While the concentration was significantly no differents with percentage (4.288±0.664a) in acute ITP , and (4.582±0.560a) .

However, there was no significantly decrease in HGB in ITP patients with (12.518±1.694A) , (13.538±1.287A) in control groups . Also there was no significantly differents in HGB level between chronic ITP and acute ITP in percentage (12.752±1.770A) in acute ITP , (12.452±1.689A) in chronic ITP .

The MCV showed a significant differened between ITP patients and control group with percentage (80.898±9.706A) in ITP patients and (84.446±4.073A) in control group.while there was increase in the concentration in the acute ITP in percentage of (85.5±8.479A),compare with the chronic ITP (79.444±9.714A).

The statistical test for the HCT test was decreased in ITP patients in percentage of 36.234±4.779A), compared with control group (40.529±3.786A) . the percentage of acute ITP was (36.333±5.069A) , while in chronic ITP was (36.202±4.755A).

There was no significantly differents between ITP patients and control in MCH with (28.192$\pm$4.124A) , (28.17$\pm$1.453A) . the MCH was increased in chronic group with percentage (37.511$\pm$4.069a) compared with the acute ITP was (30.35$\pm$3.660a).

Table 1: Total Platelet count in ITP patients and control.

PLT	PLT			
	Control (n =50)	**Total ITP (n==50)**	**Chronic ITP (n=38)**	**Acute ITP (n=12)**
Mean ± SD	270.86$\pm$60.660A (423-179)	70.160$\pm$94.398A (515-4)	75.473$\pm$95.613a (515-4)	53.333$\pm$92.406a (342-9)
P- value	0.000		0.375	

Data = Mean ± stander deviatio
A) capital letter : The mean difference is significant at the 0.05 level (two- tailed).
(a) Small letter: The mean difference is not statistically significant at the 0.05 level (two –tailed).

Table 2: some hematological parameter in ITP patients and control.

WBC	WBC			
WBC	**Control group**	**ITP patients**	**Chronic ITP**	**Acute ITP**
Mean ± SD (Range)	7.243$\pm$1.643A (11.67-4.11)	7.642$\pm$3.030A (19.1-3.5)	7.362$\pm$2.785 A (19.1-3.5)	8.533$\pm$3.698 A (16-3.5)
P - Value	P - Value = 0.000		P -Value = 001	
LYM				
Mean ± SD (Range)	2.807$\pm$3.607A (27.5-0.86)	2.315$\pm$1.039A (5.8-0.8)	2.289$\pm$0.870 A (4.9-0.9)	2.4$\pm$1.502 A (5.8-0.8)
P - Value	P -Value = 0.001		P -Value = 004	
MON				
Mean ± SD (Range)	0.539$\pm$0.159a (0.89-0.26)	0.516$\pm$0.286a (1.6-0.2)	0.506$\pm$0.289A (1.6-0.2)	0.55$\pm$0.287A (1.3-0.2)
P - V alue	P - Value = 0.137		P – Value = 0.000	
NEU				
Mean ± SD (Range)	3.962$\pm$1.512A (8.35-0.4)	4.572$\pm$2.651A (14.7-1.5)	4.316$\pm$2.078A (13-1.8)	5.383$\pm$3.980A (14.7-1.5)
P- Valu e	P -Value=0.000		P -Value=0.009	
RBC				
Mean ± SD (Range)	4.841$\pm$0.519a (6.39-4.09)	4.511$\pm$0.593a (5.55-3.11)	4.582$\pm$0.560a (5.55-3.11)	4.288$\pm$0.664a (5.29-3.39)

P- Va lue	P -Value=0.642		P -Value=0.375	
HGB				
Mean ± *SD* (Range)	13.538±1.287A (16.4-10.7)	12.518±1.694A (16.7-6.6)	12.452±1.689A (15.5-6.6)	12.752±1.770A (16.7-9.5)
P- Value	P - Value=0.00		P -Value=0.00	
MCV				
Mean ± *SD* (Range)	84.446±4.073A (94.3-75.5)	80.898±9.706A (144-59)	79.444±9.714A (144-59)	85.5±8.479A (105-74)
P- Value	P -Value=0.00		P -Value=0.005	
HCT				
Mean ± *SD* (Range)	40.529+3.786A (51.7-32.6)	36.234+4.779A (49-21)	36.202+4.755A (49-21)	36.333+5.069A (48-28)
P- Value	P -Value=0.00		P -Value=0.001	
MCH				
Mean ± *SD* (Range)	28.17±1.453A (32.9-25.2)	28.192+4.124A (42-20.1)	37.511±4.069a (42-20.1)	30.35±3.660a (37.7-25.5)
P- Value	P -Value=0.00		P -Value=0.342	

Data = Mean ± stander deviation
A) capital letter : The mean difference is statistically significant at the 0.05 level (two-tailed).
(a) Small letter: The mean difference is not statistically significant at the 0.05 level (two-tailed)

Discussion

The Table (1) of the present study showed significantly decrease in the concentration of platelet count in immune thrombocytopenia patients compared with healthy controls. The average value of PLT in all(ITP) patients was (70.160±94.398) respectively. As well as control mean values were (270.86±60.660). also , the results showed significantly increase in the concentration of PLT in acute ITP patients when compared with chronic ITP . the mean value of PLT in all acute patients was (53.333±92.406), while the chronic patients was (975.473±95.613) **.** our results study agree with [10] . As well as for acute and chronic patients with ITP . Either a high clearance of platelets from the peripheral circulation or a poor production of platelets can result in low platelet count, also known as thrombocytopenia . [11] Immune thrombocytopenia purpura (ITP) is an autoimmune disease characterized by an isolated decrease in platelet count and an increased risk of bleeding . A number of Immune system components are affected by the intricate pathophysiology, which results in peripheral platelet destruction as well as compromised

central megakaryopoiesis and platelet synthesis in the bone marrow .[12] Also, Recent research recommends that platelets have a crucial role in the aetiology of autoimmune disorders. [13] Cytokine imbalance also contributes to a decrease in the number of platelets in the blood in patients with ITP, The production of cytokines including TNF-α, IL-2, and IFN-γ increases when there is a shift in the Th1 cytokine profile, which is present in ITP. When cytotoxic T cells and macrophages are activated, platelets are destroyed. This is linked to this change. [14] Patients with ITP have been shown in multiple investigations to have activated T lymphocytes that are reactive to platelets. The cytokine balance is disrupted in these patients, favouring the generation of interferon (IFN)-γ and IL-2 . [2] also there are many mechanism to destroy the PLT in ITP patients beside the cytokine imbalance. [15] explain ITP is caused by a variety of mechanisms, includes platelet damage caused by cytotoxic T cells megakaryocyte Inhibition of microthrombus production by platelet activation autoantibodies, complement activation, increased platelet desialysis and mortality, and phagocytosis of antibody-opsonized platelets . In our study, chronic ITP showed significantly lower platelet counts than acute ITP. [16] , agree with our findings, which show that at baseline, the mean and median platelet counts in cITP patients were lower than in the ITP group as a whole and lower in children than in adults . [17], also agree with our results .

As shown in the table (2) There was no increase or decrease in the percentage between ITP patients and control . but there was increase in the concentration of WBC in acute ITP patients . AS well , there were no significant difference in LYM and RBC between ITP patients compared to healthy subjects , As well as for acute and chronic patients . Furthermore , there was no decrease or increase in the concentration of monocytes in all Immune thrombocytopenia patients and healthy control . while in the NEU there was increased in the level of NEU in Immune thrombocytopenia patients when compared to the control . as well in acute ITP there was increased in NEU level. [10], was agree with our results . the level of hemoglobin was reduced in ITP patients compared to controls, also there was no different between chronic and acute ITP patients . there was increase in the level of MCV and HCT in control groups , while the MCV was decreased in the chronic ITP , while the HCT was the same for acute and chronic ITP . as the results indicates there was increased in the MCH in chronic ITP when compared with acute ITP . and

there was no change in the level of MCH between ITP patients and healthy control . In individuals with immune thrombocytopenic purpura, WBC count, hemoglobin concentration, red blood cells indices , and differential values were usually normal, Whether it was high or low, it was very slight because the disease is believed to cause inflammation in the body . [18] , concur and demonstrate that research in recent decades has revealed a significant incidence of inflammation in ITP patients. More significantly, it can worsen the ITP by boosting immune cells such neutrophils, lymphocytes, platelets, and monocytes. [19] Although a hematology test is not a particular test, it can be used to identify inflammatory diseases and track the course of a disease as well as the response to treatment. While ,HCT are significant low in ITP patients compered to control .even the HGB was not significant not very low in ITP patient , the low HGB due to the low platelets in the patients with ITP . [20] , show that In individuals with pre-existing thrombocytopenia or platelet dysfunction, anaemia can affect primary haemostasis further due to a disruption in normal red blood cell (RBC) rheology. Numerous studies on both healthy individuals and those with thrombocytopenia further highlight the link between elevated bleeding time and low haemoglobin . [21],[22],[23]

Conclusion

Based on the results of this investigation , we conclude that understanding the disease status and course in ITP patients requires an awareness of the clinical importance and prognostic usefulness of hematological indicators in patients with Immune thrombocytopenia purpura.

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Authors' contribution

Conceptualization: Rawan A. Hussein

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Formal analysis: Rawan A. Hussein

Funding acquisition/:

Investigation: Noor H. Al-Mousawi

Methodology: Noor H. Al-Mousawi

Project administration:

Resources: Rawan A. Hussein

Software: Rawan A. Hussein

Supervision: Noor H. Al-Mousawi

Validation: Noor H. Al-Mousawi

Visualization: Noor H. Al-Mousawi

Writing–original draft: Rawan A. Hussein

Writing–review & editing: Noor H. Al-Mousawi

Ethical Statement

This study was conducted in accordance with the principles outlined in the Declaration of Helsinki and obtained ethical approval from the Ethics Committee of Wasit University/College of Science (ID No.: IR.SUMS.MED.REC.1401.408). Accordingly, written informed consent was taken from all participants before any intervention .

Conflicts of interest

The authors declare that they have no competing interests .

Funding / support

None .

Study Highlights

1 .What is the current knowledge?

- Immune thrombocytopenia purpura (ITP) is an autoimmune disorder characterized by decreased platelet count.

- Common symptoms include bruising, petechiae, and bleeding due to reduced platelet levels.

- Hematological indicators, such as platelet count and white blood cells, play a role in diagnosing and assessing ITP.

2. What is new here?

- This study demonstrates a significant decrease in platelet count in Immune thrombocytopenia purpura patients compared to healthy controls.

- It highlights the distinct differences in hematological indicators between acute and chronic ITP patients.

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