TO STUDY THE OCULAR MANIFESTATIONS OF BLOOD DYSCRASIAS IN PAEDIATRIC AGE GROUPPramod Kumar Chhawania¹, Prashant Raj Pipariya²**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: The ocular fundus examination offers a unique opportunity for direct observation of small blood vessels and vascular lesions. The retina is the great meeting place between ophthalmology and general medicine. Therefore, in any systemic condition, fundus examination helps in the diagnosis and/or prognosis of the condition. A study of 100 patients of all types and forms of the blood dyscrasias who were admitted at Kamla Raja Hospital, Gwalior was done. The examinations and investigations were carried out as follows. The findings and reports were noted. Patients from age group 0 to 18 years and Patients diagnosed as anemia, leukemia and thrombocytopenia were included in the study, whereas patients more than 18 years of age were excluded. 70 patients were of all types of anaemia, 20 of leukemia and 10 of idiopathic thrombocytopenia. In anaemia, Iron deficiency anaemia is the commonest (55%). In leukemia, AML, ALL and CML are having an almost equal incidence. They are more in females. Retinal exudates are an occasional finding (16%). Hb. concentration usually remains between 3 to 6 gm%. Total W.B.C. count is having importance in chronic leukemia, retinopathy develops when it is more than 1.0 lac/cumm. No significant co-relation with the amount of circulating blast cells. Iron deficiency anaemia is the commonest. Iron deficiency anaemia is more common in females while other types are more common in males. AML, ALL and CML are having an almost equal incidence of leukemia. They are more in females. Retinal hemorrhages (though of different types) with dilated and tortuous veins occur in almost all cases of leukemia.

KEYWORDS: Anaemia, Leukemia, Iron deficiency, haemorrhage.

INTRODUCTION: The ocular fundus examination offers a unique opportunity for direct observation of small blood vessels and vascular lesions.

The retina is the great meeting place between ophthalmology and general medicine. Therefore, in any systemic condition, fundus examination helps in the diagnosis and/or prognosis of the condition.

Besides the skin and mucous membranes, where blood dyscrasias can sometimes produce visible symptoms, the retina presents our best early diagnostic opportunity. Indeed, significant ocular manifestations are not uncommon in these disorders and vision related issues may be the presenting symptom. However, since patients may often present without symptoms, a review of retinal signs associated with blood dyscrasias is warranted.

Most of the chronic forms of the disease with disturbances or alteration in haematopoietic system may exhibit a marked progressive anaemia, accompanied by enlargement of spleen and liver and a distinctive blood picture. The variety and the extent of the eye changes may be said to depend in general on the type and involvement of the other structures, particularly those of the blood and blood forming tissues.

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MATERIAL AND METHODS: A study of 100 patients of all types and forms of the blood dyscrasias who were admitted at kamlaraja hospital, Gwalior was done. The examinations and investigations were carried out as follows. The findings and reports were noted. Patients from age group 0 to 18 years and Patients diagnosed as anaemia, leukemia and thrombocytopenia were included in the study whereas patients more than 18 years of age were excluded.

Detailed history particularly about the age, sex and socio-economic status were noted. History of visual trouble especially sudden or gradual diminution of vision was asked. The other complaints, particularly fever with or without rigor; headache, weakness, and pain in the abdomen were asked. Any past history, particularly the similar complaints and any drugs taken were noted. Any history of bleeding tendency was noted. Blood dyscrasias in family or other diseases like tuberculosis, diabetes, hypertension, etc. in the family were asked. The following examinations after taking history were carried out:

1. Fundus findings were observed after dilation of the pupil.

The following detailed examination was done:

- a) Optic disc: The colour, shape, size, margin and cup are examined. Any abnormalities, particularly hemorrhages, neovascularisation or pigmentations were noted.
- b) Blood vessels: Blood stream, caliber, sheathing, A/V crossing any pulsations were noted.
- c) General fundus: In this, any abnormalities particularly the retinal hemorrhages whether it is superficial or deep, fresh or absorbing, its shape and distribution were also noted. The superficial (soft) and hard exudates were noted. Other abnormalities like pigmentation, detachment and vascular proliferation noted.
- d) Macula: Foveal reflex, hemorrhages or pigmentation if present, was noted.

INVESTIGATIONS: Complete blood count, bleeding, clotting and prothrombin time were also done particularly for hemorrhagic disorders, Peripheral smear stained with Leishman's stain and any premature blast cells, shape and color of R.B.C., malarial parasite or any abnormalities were examined, G6PD deficiency test: it was also done to find out whether the patient is G6PD deficiency positive or not, Serum iron and serum iron binding capacity: it was also done. The normal value of serum iron is 80 to 120 micrograms. It is important in iron deficiency anaemia.

OBSERVATION: In the present study, 100 patients of all types of blood dyscrasias who attended OPD or admitted at a Kamlaraja hospital in the department of pediatrics, Gwalior were examined with full details. All the investigations were carried out at the pathological laboratory of the same hospital. The findings are as follows:

Types of blood dyscrasias	Number of patients	Percentage
Anaemia (all types)	70	70
Leukemia (all types)	20	20
Thrombocytopenia	10	10
Total	100	100

Table 1: Showing relative frequency of various types of blood dyscrasias in 100 patients

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Out of 100 patients of blood dyscrasias, 70% are of all types of anemia, 20% are of leukemia and remaining 10% are of thrombocytopenia. This shows that a higher percentage of patients with blood dyscrasias are all types of anemia and next is all types of leukemia.

Types of anaemia	Number of patients	Percentage
Iron deficiency	38	55.0
Thalassemia	12	17.5
G.6.P.D. deficiency	11	15.0
Hypoplastic	7	10.0
Dimorphic	2	2.5
Total	70	100

Table 2: Showing relative frequency of different type of anaemia in 70 cases of anaemia

In 70 patients of all types of anaemia, the maximum number of patients is of iron deficiency anaemia (55%). Thalassemia is 17.5% and G.6.P.D. Deficiency is 15.0% next to iron deficiency. Remaining are hypoplastic 10% and dimorphic 2.5%.

Types	Male	Percentage	Female	Percentage	Total
Iron deficiency	17	45.4	21	54.6	38
Thalassemia	8	67	4	33	12
G.6.P.D. deficiency	5	46	6	54	11
Hypoplastic	3	43	4	57	7
Dimorphic	-	-	2	100	2

Table 3: Showing sex incidence in different types of anaemia in 70 patients

The above table shows that iron deficiency anemia is more common in female than male, perhaps due to blood loss, pregnancy and lactation.

Types	Total Number of Patients	Retinal haem.	Flame shape	Haem. With white centre	Sub-hyloid	Vit. haem.
Iron deficiency	38	2	2	-	-	-
Thalassemia	12	-	-	-	-	-
Hypoplastic	7	4	4	-	-	-
Dimorphic	2	2	2	1	-	-
G.6.P.D. deficiency	11	3	3	-	-	-
Total	70	11	11	1	-	-

Table 4: Showing the incidence of different types of retinal hemorrhages in 70 patients of all types of anaemia

Out of 70 patients of all types of anaemia, 11 patients (15%) shows retinal hemorrhages which are flame shaped. In dimorphic, hemorrhages have white centre.

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Types	Total no of patients	Pallor of optic disc	Percentage
Iron deficiency Anaemia	38	21	55.26
Thalassemia	12	3	25
G6PD Deficiency	11	4	36
Hypoplastic	7	4	57
Dimorphic	2	0	0

Table 5: Showing the incidence of pallor of optic disc in different types of anaemia in 70 patients

In iron deficiency anaemia, pallor of the optic disc occurs in 55.26%. In G.6.P.D. Deficiency and hypoplastic, pallor occurs in 36% and 57% respectively.

Hemoglobin Concentration in gm%	Total number of patients	Retinopathy in Number of patients	Percentage
Less than 3.0	28	9	32.14
3.0 to 5.0	42	2	4.7

Table 6: Showing comparison of Hb. concentration and retinopathy in 70 patients of all types of anaemia

Retinopathy occurs in 32.14% when Hb. concentration is less than 3.0 gm%. When Hb. concentration is more than 3.0 gm%, it is only in 4.7%.

RBC count in million/cumm	Total number of patients	Pallor of optic disc	Percentage
Less than 2.0	38	24	63.15
More than 2.0	32	9	28.12

Table 7: Showing comparison of R.B.C. count in million/cumm and pallor of the optic disc in 70 patients of all types of anaemia

63.15% developed pallor of the optic disc when R.B.C. count is less than 2.0 million/cumm.

Types	Male	Percentage	Female	Percentage	Total
AML	3	50	3	50	6
ALL	3	60	2	40	5
CML	2	40	3	60	5
CLL	2	67	1	33	3
AAL	1	100	-	-	1

Table 8: Showing sex incidence in 20 cases of leukemia

Above table shows that all types of leukemia are more common in males than females.

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Types	Total no. of patients	Retinal hge.	Flame shaped	Discrete	Sub-hyloid	Hge. with white centre	Mac. Hge	Vit. Hge
AML	6	3	2	3	1	3	1	-
ALL	5	3	1	2	0	2	0	-
CML	5	2	1	1	-	2	-	-
CLL	3	-	-	-	-	-	-	-
AAL	1	1	1	1	0	1	-	-
TOTAL	20	9	5	7	1	8	1	-

Table 9: Showing the incidence of different types of retinal hemorrhages in 20 cases of leukemia

Out of 50 cases of different types of leukemia, retinal hemorrhages occur in AML (50%), in ALL (60%), in CML (40%), in CLL (0%) and in AAL (100%). Out of 9 cases of retinal hemorrhages in all types of leukemia, 8 cases (88%) show hemorrhages with white centre. Out of 9 cases of retinal hemorrhages in all types of leukemia, only 1 case has sub-hyloid hemorrhage. There was not a single case of vitreous hemorrhage. In 9 cases, 4 cases have macular hemorrhages. Out of 9 cases of retinal hemorrhages, 7 cases (77.8%) show discrete hemorrhages, while flame shaped in 5 cases (55.5%).

Types	Total no. of patients	Dilated and tortuous veins	Percentage
AML	6	3	50
ALL	5	3	60
CML	5	3	60
CLL	3	2	66
AAL	1	1	100

Table 10: Showing the incidence of dilated and tortuous veins in 20 cases of leukemia

In all types of leukemia, dilated and tortuous veins developed in more than 50%.

Types	Total no. of patients	Retinal exudates	Percentage
AML	6	1	16.6
ALL	5	1	20
CML	5	-	-
CLL	3	-	-
AAL	1	1	100

Table 11: Showing the incidence of retinal exudates in 20 cases of all types of leukemia

Retinal exudates found in only acute leukemia (16.6%), while it is absent in chronic leukemia.

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Types	Total no. of patients	Early papillo-edema
AML	6	-
ALL	5	1
CML	5	-
CLL	3	-
AAL	1	-

Table 12: Showing the incidence of papilloedema in 20 cases of leukemia

Early papilloedema is found in 1 case of ALL.

Types	Total no. of patients	sheathing	Localised nodule	Microaneurysms	Neovascularisation
AML	6	1	-	-	-
ALL	5	-	-	-	-
CML	5	1	-	-	-
CLL	3	-	-	-	-
AAL	1	-	-	-	-

Table 13: Showing the incidence of sheathing of veins, localised nodules, microaneurysms and neovascularisation in 20 cases of leukemia

Sheathing of veins found in only 2 cases.

Hb. concentration in gm%	Total no. of patients	Retinopathy	Percentage
Less than 3.0	0	0	0
3.0 to 6.0	7	6	85.7
More than 6.0	5	1	25.2

Table 14: Showing the comparison of Hb. percentage and incidence of retinopathy in 12 patients of acute leukemia

There was not a single case of acute leukemia in which Hb% is less than 3.0 gm%. The retinopathy occurs in 85.7% when Hb. concentration is between 3 to 6 gm%. It suggests that retinopathy in acute leukemia has relation with low Hb. concentration.

Hb. concentration in gm%	Total no. of patients	Retinopathy	Percentage
Less than 3.0	0	0	0
3.0 to 6.0	5	3	60
More than 6.0	3	0	0

Table 15: Showing the comparison of Hb. concentration and incidence of retinopathy in 8 cases of chronic leukemia

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It shows that retinopathy occurring in chronic leukemia is 60% when Hb. concentration is in between 3 to 6 gm%. When Hb. is more than 6 gm%, there was not a single case of retinopathy.

P.C. in Lac/cumm	Total no of patients	Retinopathy	Percentage
Below 1.0	9	6	66.6
Above 1.0	3	1	33.3

Table 16: Showing comparison of platelet count and incidence of retinopathy in 12 cases of acute leukemia

66.6% show retinopathy when platelet counts below 1.0 lac/cumm. While retinopathy occurs in 33.33% when platelet count is above 1.0 lac/cumm.

P.C. in million/cumm	Total no. of patients	Retinopathy	Percentage
Below 1.0	5	2	40
Above 1.0	3	1	33

Table 17: Showing comparison of platelet count and incidence of retinopathy in 8 cases of chronic leukemia

40% show the retinopathy when platelet count is below 1.0 lac/cumm, while in 33% only when platelet count is above 1.0 lac/cu mm.

WBC count in thousand/cu mm	Total no. of patients	Retinopathy	Percentage
Below 25	7	5	71.4
Above 25	5	2	40

Table 18: Showing comparison of total W.B.C. count and incidence of retinopathy in 12 cases of acute leukemia

71.4% show retinopathy when W.B.C. count is less than 25000/cu mm and in 40% of retinopathy when W.B.C. The count is more than 25000/Cu mm.

Blast cells % in 100 WBC	Total	Retinopathy	Percentage
Less than 20	5	2	40
More than 20	7	5	71.4

Table 19: Showing comparison of blast cells and incidence of retinopathy in 12 cases of acute leukemia

Above table suggests that retinopathy in acute leukemia and circulating premature cell has little relationship.

Blast cells % in 100 WBC	Total	Retinopathy	Percentage
Below 20	5	2	40
Above 20	3	1	33.33

Table 20: Showing comparison of blast cells percentage and incidence of retinopathy in 8 cases of chronic leukemia

60% of the patients having blast cell less than 20% and 66.66% having blast cell more than 20% have no retinopathy.

DISCUSSION: Attempts have been made to describe the appearance of the retina in disease of the blood. As though they were characteristic of the types of anaemia, leukemia or purpura in which they occurred but it is quite impossible to diagnose the type of disease from the picture presented by the fundus. There are, however, certain common denominations in these diseases which predispose to the formation of retinal lesion.

The most important of these being the extent of the deficiency of Hb, the number of circulating immature cells (Marshall-1959) and the degree of thrombocytopenia (Wegner and Ricker-1948). The retinopathy is not only due to adverse effects of lowered oxygen tension in blood, but change in blood chemistry also have a harming effect (Viethues and Strobe 1959). The venous stasis, blocking of the capillaries by cellular emboli may at any time alter the fundus picture.

In the present study of 100 cases of blood dyscrasias, there are 70 patients with various types of anemia, 20 patients with leukemia and 10 patients with thrombocytopenia.

(1) ANAEMIA:

A) RETINAL HEMORRHAGES: Retinal hemorrhages occurred in 11 patients (15%) out of 70 patients of all types of anaemia:

- a) Iron deficiency anemia: In 38 patients with iron deficiency anemia, 3 patients (5.2%) developed retinal hemorrhages. Cosnett and Haeleod (1959) examined 74 cases of iron deficiency anaemia in Indians and reported that retinal hemorrhages are rare in iron deficiency anaemia.
- b) G.6.P.D. Deficiency: In 11 patients of G6PD deficiency, 3 patients (27.27%) developed retinal hemorrhages.
- c) Thalassemia: In Thalassemia, there was not a single case of retinal hemorrhage.
- d) Hemolytic anaemia: In 13 cases of hemolytic anaemia, 2 patients (15.38%) developed retinal hemorrhages. Holt and Smith (1969)¹⁷ reported 2 cases of retinal hemorrhages in 8 patients of hemolytic anaemia.
- e) Hypoplastic anemia: In 7 patients with hypoplastic anemia, 4 patients developed retinal hemorrhages. Holt and Smith (1969)¹⁷ observed 3 cases of retinal hemorrhages out of 7 cases of hypoplastic anemia. In all these types of anemia, there was not a single case of retinal hemorrhages with white center.
- f) Dimorphic anaemia: In our series there were 2 cases of dimorphic (Megaloblastic with iron deficiency) anaemia. In both the cases, retinal hemorrhages with white centre were present. Due to less number of cases it is impossible to co-relate with other series. Holt and Smith (1969)¹⁷ reported retinal hemorrhages in 7 cases out of 15 cases of pernicious anaemia. Davidson noted that pernicious anaemia is not common in Indians. Hemorrhages with white centre are characteristics of pernicious anaemia but it is less frequent than leukemia.
- g) Hb <3gm%: Retinal hemorrhages were found in 31.25% when Hb. concentration was less than 3.0gm%. While it was found in only 4.1% when Hb% is more than 3.0 gm%. It suggests that retinal hemorrhages are common when Hb. concentration is much less.

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These findings are consistent with findings of Holt and Smith. Hemoglobin is a mediator to carry oxygen. When Hb. concentration falls, the oxygen carrying capacity of the blood decreases and tissue suffers from anoxia which ultimately lead to changes in permeability of capillaries and under this circumstances seepage of blood takes place. Rubenstein et al (1966)³⁰ reported that retinopathy in anaemia occurs in 44% of patients when there is severe anaemia and thrombocytopenia.

(2) PALLOR OF OPTIC DISC: In 70 patients of all types of anaemia, pallor of optic disc occurred in 32 patients (45%).

- a) Iron deficiency anemia: In 38 patients with iron deficiency anemia, pallor of the optic disc occurred in 12 patients (55.26%).
- b) Hb <3gm%: Pallor of optic disc occur in 100% when the Hb. concentration is less than 3.0 gm%, while it was found in only 9.5% when the Hb. concentration was more than 3.0 gm%. Marshall (1959)²⁴ noted that pallor is most common when Hb. concentration is less than 3.0 gm%. Ballentyne and Michaelson (1962) also noted that pallor is present when Hb. concentration is much less.
- c) RBC count <2 million/cumm: In our study, pallor occurs in 63.15% when the R.B.C. The count was less than 2.0 million/cumm, while it was only in 28.12% when R.B.C. count was more than 2.0 million/cumm. Meckensie (1884) and Foster Moore (1925) noted that pallor occur when R.B.C. count is less than 50% i.e. 2.0 million/cumm.
- d) Hypoplastic anaemia: In our series, there were 2 cases (50%) of retinopathy in hypoplastic anaemia. Due to less number of patients, co-relation is not possible.
- e) G6PD deficiency: Warburg, Cohn and carter (1977) have examined a case of optic atrophy in G.6.P.D. Deficiency. In our series there were 2 cases of the pallor of optic disc, but not optic atrophy in G.6.P.D. Deficiency anaemia.

B) DILATED AND TORTUOUS VEINS: In our series, there were 34.28% of dilated and tortuous veins in all types of anaemia. As mention above, it is due to anoxia resulting in change in capillary permeability and venous stasis.

C) PAPILLOEDEMA: Swelling of the optic disc, however is not an uncommon sign in the severe forms, sometimes associated with distension of veins, producing a picture similar to that of papilloedema indeed the disc may be more edematous than in any other forms of anemia and occasionally the swelling may reach up to several debtors (Elwyn 1947). It is bilateral and it disappears when iron therapy is given (Lubeck 1959).²³ In our series there was not a single case of papilloedema in 22 cases of iron deficiency anaemia.

Bonnet (1947) noted lipid deposition at macula and forming a macular star in pernicious anaemia. In our study, there was only a single case of megaloblastic anaemia without any type of exudate. So no co-relation is possible.

(3) LEUKEMIA:

A) RETINAL HEMORRHAGES: The retinal hemorrhages are not common in leukemia particularly in acute leukemia. The figures of retinal hemorrhages in all types of leukemia are 43% by Bergaon (1929), 48% by Frank (1936), 48% by Cellar (1951) and 30% by Holt and Smith (1969). In our study, the incidence is 52%.

- a) Acute leukemia: The figures of retinal hemorrhages in acute leukemia are 38% by Goldbach (1933), 77% by Dollun (1931) and Dyton (1961), 71% by Celler (1951) and 40% by Holt and Smith (1969), while in our series, the incidence is 58.3%. AML- 50%, ALL- 60%, AAL- 100%
- b) Chronic leukemia: The incidence of retinal hemorrhages in chronic leukemia is 18% by Goldbach (1933) and 20% by Holt and Smith (1969) while in our series, it is 25%. CML- 40%, CLL- 0%.

In our study, out of 9 patients having retinal hemorrhages, only 55.5% had a flame shaped hemorrhages and 77.8% had discrete hemorrhages. In Holt and Smith's series, flame shaped hemorrhages in 14 cases and discrete hemorrhages in 31 cases out of 48 cases of leukemia. In our series, the incidence of hemorrhages with white centre is 8 cases (88.89%). Olmer and Prananer (1952) said that its incidence is very high.

In our series there was 1 case of sub-hyloid hemorrhage out of 50 cases. Holt and Smith found 2 cases out of 48. There was not a single case of vitreous hemorrhage.

B) DILATED AND TORTUOUS VEINS: Dilatation and tortuosity of retinal vessels, particularly of veins are also common findings in leukemia. The incidence expressed by different workers is very variable. The figures are 77% (Gibson), 37% (Bergeon and Wegner 1929), and 25% by Frank (1939) and in our series; the incidence is 60% in all types of leukemia. In our study, the incidence of venous dilatation and tortuosity in myeloid leukemia is high (AML - 50%, CML - 60%). One of the most common factors for dilatation and tortuosity of the retinal vessels is a high viscosity of blood. In such condition an increase of viscosity 5 to 6 times is observed (Martin and Bayrd - 1954).

C) SHEATHING: In our study, sheathing of veins is seen in only cases of myeloid leukemia (AML - 1 case, CML - 1 case). No cases are seen having sheathing of the veins in lymphatic leukemia. The incidence of sheathing of veins in myeloid leukemia can be explained by the greater tendency of leukemic infiltration of myelocytes than lymphocytes (Burgeson and Wegner 1929).

D) RETINAL EXUDATES: The incidence of retinal exudates is very low in leukemia. The figures are 7% in all types of leukemia (Allen and Straatsma 1961), and 3% of acute leukemia (Holt and Smith 1969). In our study, the incidence of acute leukemia is 25% and in all types of leukemia, it is 15%. The retinal exudates in leukemia have also a relation to severe anemia.

E) PAPILLOEDEMA: Papilloedema is an occasional finding in leukemia. In our study, out of 20 cases, only 1 patient of ALL had early papilloedema. The etiology of papilloedema is firstly due to leukemic infiltration in central nervous system while secondarily raised intracranial

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tension followed by papilloedema or subdural hemorrhages lead to papilloedema (Kereibeg 1934). Secondly, it is due to prolonged steroid therapy as an anti-leukemic drug and thirdly due to leukemic infiltration locally in optic nerve head (Allen and Straatsma 1961) and perivascular infiltration of leukemic cells. In our patients, there was no sign and symptom of raised intracranial tension and patients were not on steroid therapy. So we can say papilloedema is probably due to local infiltration of leukemic cells in optic nerve head and perivascular space of the retina.

- F) LOCALISED NODULE:** Independently of retinal hemorrhages, localised nodular spots, evidently small collection of leucocyte cells are occasionally seen in the fundus of leukemia (Ballentyne and Michaelson 1962). In our series, there was not a single case of localised nodule.
- G) MICROANEURYSMS:** In our series, there was not a single case of microaneurysms. Duke, Wilkinson and Sigelman (1964), and Jaspol, Goldberg and Bruce (1975)¹⁸ noted a high incidence of retinal microaneurysms in chronic leukemia and no microaneurysm in acute leukemia. The incidence is even higher in myeloid than in lymphatic form. All workers are agreed that microaneurysms are not commonly situated at the periphery of the retina. In our series, we have not examined all the cases by indirect ophthalmoscope and Goldman 3 mirrors, so peripheral retina is not observed.
- H) NEOVASCULARISATION:** In our series, we could not find a single case of neovascularisation, Morae and McRead (1971)²⁵ described a single case of neovascularisation in CML.
- I) RETINOPATHY:** Incidence of retinal hemorrhage increases with decrease in the Hb. The concentration of blood in leukemia (Gibson 1938) and in acute and chronic leukemia, leukemic retinopathy has direct relationship with the extent of the deficiency of Hb. (Duke - Elder), so it is established that leukemic changes in the retina have relation to the level of Hb. Concentration. In our series, in acute leukemia, 85.7% of the total patients with Hb. concentration in between 3 to 6 gm% developed retinopathy while only 20% of the total patients with Hb. concentration more than 6.0 gm% developed retinopathy. In chronic leukemia 60% of the total patients with Hb. concentration in between 3 to 6 gm% developed retinopathy and there was not a single case of retinopathy with Hb. concentration above 6 gm% in chronic leukemia. It shows that retinopathy increases with decrease in Hb. Concentration. Hb. is a mediator to carry oxygen. As Hb. concentration falls, the oxygen carrying capacity of the blood decreases and tissue suffer from anoxia, which ultimately lead to changes in permeability of the vessel wall. In this situation, seepage of the unformed elements of the blood takes place through the vessel wall and lead to retinal hemorrhages and other manifestations of the fundus. Deficiency of Hb. concentration in blood is not the only cause for retinal abnormality but other factors like changes in chemical and physical properties of the blood also alter the fundus picture (Celler 1953), Holt and Smith (1969)¹⁷ and Lingutn and Goudemend (1953) established the co-relation between the level of platelet count and retinopathy in acute leukemia. Incidence of retinopathy increases in patients with

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low platelet count. They also established that retinal changes in chronic leukemia have no correlation with low platelet count. In our study, in acute leukemic patients, 66.67% developed retinopathy that had platelet count below 1 lac/cumm, while 33.33% of the total cases with platelet count above 1 lac/cumm. Developed retinopathy. It shows that incidence of retinopathy of acute leukemia is two times higher in patients having low platelet count. Platelets are one of the essential factors in the normal coagulative mechanism of the blood. Due to its deficiency, the coagulative mechanism becomes upset. In chronic leukemia, there is no exact co-relation of retinopathy and platelet count.

Bergerson and Wigner (1929) quoted that in chronic myeloid leukemia; the retinal lesions are more likely in the case of high myelocyte count in the circulation. In our series, retinopathy occurs in 40% when blast cells are less than 20%, while 60% of the patients do not develop retinopathy. In case of acute leukemia, retinopathy developed in 40% when blast cells are less than 20% and 71.14% when blast cells are more than 20%.

It shows that it is one of the factors for retinopathy. Holt and Smith (1969)¹⁷ also quoted that in acute leukemia, retinopathy has relation to high blast cell count in circulating blood. Celler (1953) and Gibson (1939) quoted that retinal lesions have no relation with high total W.B.C. count. In our series, 71.4% patients with acute leukemia developed retinopathy when total W.B.C. The count is less than 25000/cumm, while 50% show retinal hemorrhages when W.B.C. The count is above 25000/Cu mm. It shows that there are some relations of W.B.C. count to retinopathy in acute leukemia. In chronic leukemia, there is no significance of W.B.C. count to develop retinopathy.

(3) IDIOPATHIC THROMBOCYTOPENIC PURPURA: In our study, there were 10 cases, 1 female patient had retinal hemorrhage without white centre and another patient had vitreous hemorrhage. The figures for the retinopathy are very variable. Addison (1954) noted that retinopathy occur in 50% in primary thrombocytopenia which co-relate with our findings. But Port (1930) noted retinal hemorrhages in only 2 cases out of 165. Benedict (1930) noted severe intraocular hemorrhages and visual loss. Massa (1966) mentioned an infant with primary thrombocytopenic purpura who had retinopathy with severe degree of anaemia. Hawthorne (1922) thought that retinal hemorrhages are very rare in this disease. The cause is probably due to occlusion of small capillaries by fibrinogen or fibrin (Baronders 1952).

CONCLUSION: The following conclusions were drawn from the above study:

- In anaemia, Iron deficiency anaemia is the commonest. Iron deficiency anaemia is more common in females while other types are more common in males. Retinal hemorrhages are not a frequent finding in anaemia, but it is seen more frequently when Hb. concentration is less than 3.0 gm%. Pallor of the optic disc is the most common finding and is seen in all patients having Hb. concentration less than 3.0 gm%. Also, it is more frequent when R.B.C. count is less than 2 million/cumm.
- In leukemia, AML, ALL and CML are having an almost equal incidence. They are more in females. Retinal hemorrhages (though of different types) with dilated and tortuous veins occur in almost all cases of leukemia. Retinal exudates are an occasional finding. Hb. concentration

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usually remains between 3 to 6 gm%. Total W.B.C. count is having importance in chronic leukemia, retinopathy develops when it is more than 1.0 lac/cumm. No significant co-relation with the amount of circulating blast cells.

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