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Ophthalmic Manifestations of Anemia

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Abstract:
Aim:*to study the ophthalmic manifestations of anemia in patients admitted to a tertiary health care centre*
Material and Methods*: This is a prospective study done on150 patients presenting with anemia due to various causes admitted in the general medicine ward of MLB medical college, Jhansi between august 2019- february 2020*
Results:*In present study,conjunctival pallor was the commonest ocular manifestation of anaemia seen in 125 out of 150 cases(83.33%). Retinal abnormalities were the second commonest ocular manifestation seen in 35 out of 150 cases(23.33%) .Posterior pole pallor was seen as the third commonest ocular manifestation seen in 25 patients out of150(16.67%).*
45(30%) cases were <15 years of age and 105(70%) were above 15 years .68(45.33%) cases were male and 82(54.67%) were female.21(14%) of the admitted cases had anemia of mild grade, 63(42%) moderate grade and 66(44%) were of severe grade.
Retinal abnormalities were present mostly in patients with severe grade(<6g/dl) of anemia
Conclusion: *The fundus gives a picture of the arteries and the veins and thus can give important diagnostic clues in cases of anemia even before hematological reports can confirm the same. Therefore fundus examination should be a part of essential routine examination in all cases of suspected as well as confirmed anemia*
Keywords: *Anemia,retinalhaemorrhage*

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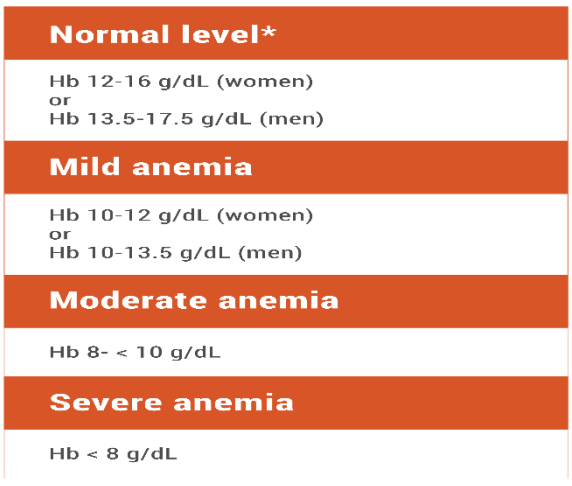
I. Introduction

Anemias occur when the level of healthy red blood cells (RBCs) or hemoglobin (an iron-binding, oxygen-carrying protein within RBCs) is too low. Depending on the cause, anemias can be classified as follows:
• Those occurring due to deficient production of RBCs from the bone marrow (hypoproliferative)
• Those due to increased blood loss (bleeding) or damage of red blood cells (hemolysis)
• Those due to abnormalities in the production of the blood cells (ineffective erythropoiesis).
Iron deficiency is the most common type of anemia.

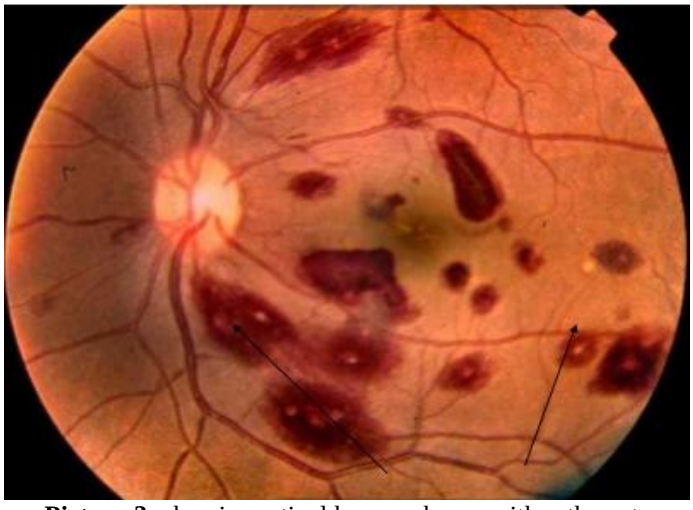


2Picture 1: showing grading of anemia

Picture2: showing conjunctival pallor in anemia

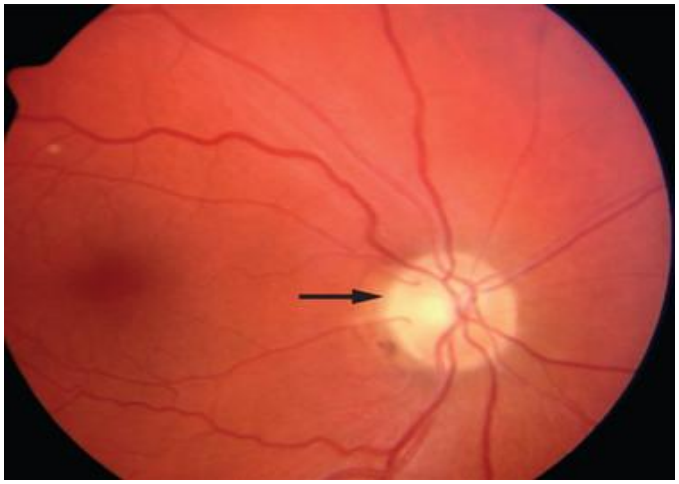
In the eye, anemia can lead to transient retinal hemorrhages. These were first described by Ulrich in 1883 in association with gastrointestinal hemorrhage[1].Conjunctival pallor is commonly present seen in the palpebral conjunctiva. Anemia causes retinopathy in 28% of patients, especially when there is coexisting thrombocytopenia (38%). As the severity of anemia increases, the risk of retinopathy increases, particularly when the hemoglobin (Hb) level is below 6 gm/dL[2].Retinal changes common to all anemias include the following:

Hemorrhages: Superficial, flame-shaped hemorrhages located in the nerve fiber layer are the most common finding in anemic retinopathy. In a few cases, dot and blot hemorrhages in deeper retinal layers may be noted. Rarely, blood may be present in the subhyaloid plane or in the vitreous. Roth spots may be seen. The white centers in Roth spots can be due to inflammatory infiltrates, fibrin and platelets, neoplastic cells, or focal areas of ischemia.3



Picture 3: showing retinal haemorrhages with roth spots

Cotton wool spots: Retinal nerve fiber layer infarction due to retinal hypoxia in anemia causes these superficial fluffy white lesions.
Retinal edema: The microtrauma of the vessel wall secondary to raised transmural pressure leads to leakage. This in turn leads to retinal edema.
Hard exudates: These may be seen due to resolved retinal edema. When these are severe and located at the macula, macular star is seen.
Vessel changes: Arteries are attenuated and pale, and veins are dilated and tortuous. These findings are seen more as the severity of anemia increases.
Optic nerve changes: Edema or, in later stages of optic neuropathy, optic disc pallor is seen[3].



Picture 4: showing disc pallor in case of thiamine deficiency anemia

Retinal changes seen in special situations include the following:
Iron deficiency anemia: Besides the routine changes, other described findings include central retinal vein occlusion, retinal artery occlusion, disc edema, and anterior ischemic optic neuropathy[4,5].

Vitamin B12 deficiency anemia: This condition causes optic neuropathy, which is evident as disc pallor[3].

Sickle cell anemia: Proliferative changes are seen in the retina secondary to vaso-occlusion, which can lead to vitreous hemorrhage and retinal detachment. Choroidal infarcts can
occur due to the sickling of red blood cells. It is interesting to note that conjunctival sickling sign and areas of iris atrophy and neovascularization occur in this disease[6].

Myeloproliferative disorders: Roth spots, leukemic infiltrates in the retina, choroidal infiltration with secondary serous retinal detachment, microaneurysms, and vascular sheathing may be seen[6].

Thalassemia: Retinal pigment epithelial changes are seen[6].

Malaria: Anemia and raised intracranial pressure due to cerebral malaria can cause retinal changes and disc edema

II. Material And method

This was a prospective study done between August 2019-February 2020 on 150 patients who were diagnosed with anemia due to various causes and were admitted in the General Medicine ward of MLB Medical College, Jhansi.It was performed under the Helsinki Declaration of 1975, as revised in 2000. The necessary permission from the Ethical and Research Committee was obtained for the study.

A study was performed on 150 patients who were selected during routine bedside fundus examination in the general medicine ward between August 2019-february 2020. Every patient underwent detailed general physical examination and complete haematological examination. Detailed ocular examination was done and those with positive fundus findings were subjected to fundus photography with theTopcon fundus camera.

Inclusion criteria

1. All patients diagnosed with anemia due to various causes admitted in the general medicine ward of MLB medical College, Jhansi between august 2019- February 2020

Exclusion criteria

1.Patients who refused examination
2.Patients with the history of other systemic diseases like diabetes or hypertension that can affect the retina
3.Patients with other retinal disorders
4.Patients with recent intraocular surgery
5.Patients with the history of trauma
6. Patients with other ocular pathology
7. Mentally or physically unfit patients

III. Results

In present study,conjunctival pallor was the commonest ocular manifestation of anaemia seen in 125 out of 150 cases(83.33%). Retinal abnormalities were the second commonest ocular manifestation seen in 35 out of 150 cases(23.33%) .Posterior pole pallor was seen as the third commonest ocular manifestation seen in 25 patients out of150(16.67%).

45(30%) cases were <15 years of age and 105(70%) were above 15 years .68(45.33%) cases were male and 82(54.67%) were female.21(14%) of the admitted cases had anemia of mild grade, 63(42%) moderate grade and 66(44%) were of severe grade.

Retinal abnormalities were present mostly in patients with severe grade(<6g/dl) of anemia

Age	**<15 years**	**>15 years**
Number of cases	**45**	**105**

Table 1: age wise distribution of cases with anemia

Sex	**Male**	**Female**
Number of cases	**68**	**82**

Table 2: sex wise distribution of cases with anemia

Grading	**Mild**	**Moderate**	**Severe**
Hb levels(g/dl)	**10-12.5**	**6-10**	**<6**
Number of cases	**21**	**63**	**66**

Table 3: distribution of cases according to grading of anemia

Signs	**Mild**	**Moderate**	**Severe**
Conjunctival pallor	**1(4.80%)**	**58(92.1%)**	**66(100%)**
Retinal abnormalities	**0**	**8(12.7%)**	**27(40.9%)**
Posterior pole pallor	**0**	**0**	**25(37.88%)**

Table 4: distribution of findings in anemia with severity

Platelet count ($10*^{3}$ per microliter of blood)	**Hb level(g/dl)**	**patients**	**Retinal haemorrhage**
	<6	**27**	**13(43.10%)**
<50	**6-10**	**5**	**2(40%)**
	10-12.5	**0**	**0**
	<6	**16**	**6(37.50%)**
50-100	**6-10**	**17**	**2(11.76%)**
	10-12.5	**0**	**0**
	<6	**23**	**1(4.35%)**
>100	**6-10**	**42**	**0**
	10-12.5	**21**	**0**

Table 5: showing relation between anemia, thrombocytopenia and retinal haemorrhages

Severity	**Disc edema**	**Flame shaped haemorrhage**	**Dot and blot haemorrhage**	**Sub-hyaloid haemorrhage**	**Roth's spots**	**Exudates**	**Dilated tortuous veins**
Mild	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Moderate	**0**	**8(7.94%)**	**0**	**0**	**0**	**0**	**2(3.17%)**
Severe	**2(3.03%)**	**19(28.79%)**	**10(15.15%)**	**14(21.21%)**	**9(13.64%)**	**7(10.61%)**	**6(9.09%)**

Table 6: showing incidence of various retinal abnormalities based on severity of anemia

IV. Discussion

In our study,conjunctival pallor was the commonest ocular manifestation of anaemia seen in 125 out of 150 cases(83.33%). Retinal abnormalities were the second commonest ocular manifestation seen in 35 out of 150 cases(23.33%) .Posterior pole pallor was seen as the third commonest ocular manifestation seen in 25 patients out of150(16.67%). Lange et al[7] have explained that the haematological disorders can manifest in all structures andadnexa of the eye.The most common manifestations are conjunctival pallor and haemorrhages, intra-retinal haemorrhages and the cotton wool spots .Retinal infiltrates , manifestation in the lids , anterior segment , opticnerve,orbit andadnexa arerare.

Retinal abnormalities in our study were seen in the form of hemorrhages, tortuous veins , exudates anddisc oedema. Flame -shaped haemorrhages were the commonest type of haemorrhage(27 cases i.e. 18%) followed by sub

hyaloid haemorrhage(14 cases i.e.21.21%). Holt J.M &Gordensmith[8] studied 63 patientswith anemia and noted that flame shaped haemorrhages were the commonest type ofhaemorrhages.

We also observed disc edema in one case diagnosed as iron deficiency anaemia with normal platelet count. A similar case was reported by Knizley etal[9] in 1969.

It was found that there is enhanced effect on manifestation of retinal haemorrhages when anaemia and thrombocytopenia are present. In patients with severe anaemia and platelet count $<50X10^3$, number of patients with retinal haemorrhages were more as compared to patients with severe anaemia and platelet count $>100x10^3$. Rubenstein and Yanoff[10] has also shown similar results i.e., retinal abnormalities get enhanced in presenceofthrombocytopenia.

In our study retinal abnormalities were more in severe anaemia (40.9%) than in moderate anaemia (12.7%)andtherehasbeennocaseofretinal abnormality inmildanemia. MerinS.&Freund[11] havealsofoundthat insevere anaemia the retinalabnormalitieswerefoundin31.8% while in moderateanaemia these were seen in only 13.3%.

Posterior pole pallor was seen in 25 patients out of 150 patients(16.67%). All were with severe anaemia which can be as a result of generalised reduced haemoglobin content. Trevor-Hoper found it in 14% cases[12]

V. Conclusion

The fundus gives a picture of the arteries and the veins and thus can give important diagnostic clues in cases of anemia even before hematological reports can confirm the same. Therefore fundus examination should be a part of essential routine examination in all cases of suspected as well as confirmed anemia..

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