

# Retinal manifestations in anaemia - a clinical study

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## Abstract

**Introduction:** Anaemia is a condition where there is decreased hemoglobin concentration or decreased RBC count. Fundus lesions can be the accompanying feature in many haematological diseases. In cases of anaemia, the exact mechanism leading to fundus abnormalities is not completely understood. The aim of this study was to calculate the prevalence of fundus lesions in anaemic patients and define the risk factors for retinopathy. This cross-sectional observational study involved fundus evaluation of 115 patients with anaemia. The prime aim was to study the prevalence of fundus findings in anaemia and the relation of retinal manifestations with severity of anaemia. The studied variables were age, gender, hemoglobin levels, red blood cell count (RBC), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), red cell distribution width (RDW), platelet counts, mean platelet volume (MPV).

**Keywords:** anaemia, hemoglobin, optic disc pallor, roth spots, exudates, disc edema.

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## INTRODUCTION

In the present study 115 patients with anaemia were studied. Patients with hemoglobin concentration of 10 g. per 100 ml. or less were examined. The pupils were dilated before every examination. Note was made of the appearance of the optic disc, the presence of exudates and hemorrhages, and whether the hemorrhages were discrete, flame-shaped, or subhyaloid. Fundus photographs were taken. The blood counts were recorded. The patients with hypertension and diabetes and anaemia due to secondary cause were excluded from study.

## RESULTS

Retinopathy was observed in 27% of the patients in the study group, the presence of fundus lesions being closely

associated with severe anemia (Hb < 8 g/dl). The most common fundus finding was the optic disc pallor, followed by the roth spots and then the superficial flame shaped hemorrhages.

## INTERPRETATION AND CONCLUSION

Retinopathy is a frequent finding in anaemic patients, although it is often not significant clinically. As retinal hemorrhages were found in all of the patients with concomitant severe anaemia, it is recommended that all anaemic patients undergo routine fundus examination.

**Table 1:** Gender distribution of patients studied

Gender	No. of patients	%
Male	45	39.13
Female	70	60.87
<b>Total</b>	<b>115</b>	<b>100.00</b>

**Table 2:** Age distribution of patients studied

Age in years	No. of patients	%
15-20	11	9.57
21-30	29	25.22
31-40	16	13.91
41-50	25	21.74
51-60	17	14.78
61-70	13	11.30
71-80	3	2.61
>80	1	0.87

<b>Total</b>	<b>115</b>	<b>100.00</b>
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**Inclusion Criteria**

1. Cases of anaemia with haemoglobin concentration of < 10 g/dl
2. Age >15 yrs

**Exclusion Criteria**

1. Diabetics and hypertensives
2. Anaemia due to secondary cause
3. Age < 15 yrs

**DISCUSSION**

In the present study, optic disc pallor was the commonest retinal manifestation of anaemia seen in 21 out of 115 cases. Second common was roth spot seen in 4 out of 115 cases. Others were superficial flame shaped hemorrhages, soft exudates and disc edema. Duke Elder and Dobree have explained that a phenomenon in the conjunctiva producing the “ivory eye” is so commonly seen that this sign may be of little value for the ophthalmologist while evaluating ocular findings in anaemia. Lange *et al.* have explained that the hematological disorders can manifest in all structures and adnexa of the eye. The most common manifestations are conjunctival pallor and hemorrhages, intra-retinal hemorrhages and the cotton wool spots. Retinal infiltrates, manifestation in the lids, anterior segment, optic nerve, orbit and adnexa are rare. In the fundus of eye as in no other part of the body, the columns of both arterial and venous blood lie exposed, so that at any time during life they can be observed through the ophthalmoscope, examined in detail with convenient magnification and photographed. Of the various blood disorders, the ophthalmologist is thus often the first observer of ocular manifestations of systemic disease before the patient reaches the hematologist, whose analysis gives the final diagnosis.

**OBSERVATIONS**

**Table 3:** Comparison of Study variables according to fundus findings

variables	Fundus findings		Total (n=114)	P value
	Normal (n=92)	Abnormal (n=22)		
Age in years	41.21±16.93	43.91±16.14	41.73±16.75	0.499
Males	38(41.3%)	7(31.8%)	45(39.5%)	0.414
Females	54(58.7%)	15(68.2%)	69(60.5%)	
RBC	3.58±1.61	2.89±0.87	3.45±1.52	0.055+
Hemoglobin	8.06±2.58	6.81±1.91	7.82±2.50	0.035*
HCT	26.49±6.99	21.03±5.96	25.44±7.12	0.001**
MCV	80.76±12.54	87.00±19.33	81.97±14.22	0.065+
MCH	25.81±5.03	28.59±7.39	26.35±5.63	0.037*
MCHC	32.08±2.34	32.26±2.79	32.12±2.42	0.762
RDW	14.25±3.25	14.00±2.87	14.20±3.17	0.732
Platelet count	2.74±1.89	2.24±2.22	2.64±1.96	0.281

RBS	86.86±17.01	87.59±22.74	87.00±18.14	0.866
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**Comparison of variables according to normal and abnormal findings of fundus**

The number of patients with normal fundus findings were 92 and with abnormal fundus were 22. The mean age in years in patients with abnormal fundus was 43.91 years with standard deviation of ±16.14 years and the normal fundus was 41.21±16.93. 38 male patients (41.3%) had normal fundus and 7 males (31.8%) had abnormal fundus. 54 female patients (58.7%) had normal fundus and 15 females (68.2%) had abnormal fundus. There was no clinically significant gender preponderance of fundus findings in the study group.

RBC	3.58±1.61	2.89±0.87	3.45±1.52	0.055+
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The mean value for RBC count in patients with abnormal fundus was 2.89 with SD±0.87 whereas the normal fundus had mean value 3.58±1.61 with p value of 0.055 which has suggestive significance to lower value with abnormal fundus findings

Hemoglobin	8.06±2.58	6.81±1.91	7.82±2.50	0.035*
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The haemoglobin concentration in patients with abnormal fundus was 6.81±1.91 and 8.06±2.58 in patients with normal fundus which was statistically moderately significant with p value of 0.035.

HCT	26.49±6.99	21.03±5.96	25.44±7.12	0.001**
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HCT value of 21.03±5.96 showed statistically strong significance towards an abnormal fundus manifestation (p-0.001) and values above 26.49±6.99 had tendency for normal fundus in the study group.

MCV	80.76±12.54	87.00±19.33	81.97±14.22	0.065+
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MCV of 87.00±19.33 had a suggestive significance of an abnormal fundus (P-0.065) and values in the range of 80.76±12.54 had less chance of anaemic fundus manifestations.

MCH	25.81±5.03	28.59±7.39	26.35±5.63	0.037*
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MCH values of abnormal fundi showed values in range of 28.59±7.39 (0.037) and normal fundi had values <25.81±5.03, which was moderately significant.

**Table 4:** Fundus findings

Fundus findings	No. of patients (n=115)	%
Normal	84	73
Abnormal	31	27
OD Pallor	21	18.2
ROTH SPOTS	4	3.47
HEMORRHAGE	3	2.60
DISC EDEMA	1	0.8
CWS	2	1.73

Table 5:

Optic disc pallor	Hemoglobin concentration	No. Of patients
	<8 g/dl	16
	> 8g/dl	5
<b>Total</b>		<b>21</b>

Table 6:

Roth spots	Hemoglobin concentration	No. Of patients
	<8 g/dl	4
	> 8g/dl	0
<b>Total</b>		<b>4</b>

Table 7:

Superficial hemorrhages	Hemoglobin concentration	No. Of patients
	<8 g/dl	4
	> 8g/dl	0
<b>Total</b>		<b>4</b>

Table 8:

Cotton wool spots	Hemoglobin concentration	No. Of patients
	<8 g/dl	2
	> 8g/dl	0
<b>Total</b>		<b>2</b>

Table 9:

Disc edema	Hemoglobin concentration	No. Of patients
	<8 g/dl	1
	> 8g/dl	0
<b>Total</b>		<b>1</b>

From the above tables it is evident that most of the fundus manifestations are characteristically seen in severe anaemia (Hb concentration <8 g/dl ) (Table 4).The most common fundus manifestation in the study group observed was optic disc pallor (21 patients) (Table 5 )followed by presence of roth spot (4 patients ) (Table 6) and superficial haemorrhages (3 patients) (Table 7).Other manifestations noted were, CWS (2 patients) (Table 8) and disc edema (1 patient) (Table 9).The hematological parameters which have a clinically significant correlation to abnormal fundi were low measures of haemoglobin concentration, HCT, MCV and MCH values. Unlike Rubenstein and Yanoff study which has also shown retinal abnormalities getting enhanced in presence of thrombocytopenia, there was no observed abnormal fundus findings with thrombocytopenia which was statistically significant in the study group. These fundus manifestations will resolve once underlying anaemia is treated.



Figure 1: Superficial flame shaped haemorrhages



Figure 2: Roth spots with disc pallor



Figure 3: Tortuosity of retinal vessels with optic disc pallor



Figure 4: Disc edema in a patient with anaemia

## STATISTICAL METHODS

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance. The following assumptions on data is made.

**Assumptions:** 1. Dependent variables should be normally distributed, 2. Samples drawn from the population should be random, Cases of the samples should be independent Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups Inter group analysis) on metric parameters. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups

### Significant figures

+ Suggestive significance (P value: 0.05<P<0.10)

\* Moderately significant (P value: 0.01<P ≤ 0.05)

\*\* Strongly significant (P value: P≤0.01)

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