www.jmscr.igmpublication.org
Impact Factor (SJIF): 6.379
Index Copernicus Value: 71.58
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v6i5.17

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Retinal Changes in Anaemia: An Observational Study

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Abstract
The present study is an observational study conducted in 256 patients diagnosed with anaemia due to various diseases. The prime aim was to study the involvement of different parts of eye in anaemia and its co-relation with severity of anaemia. Conjunctival pallor was the commonest ocular manifestation seen in 98% cases. Retinal abnormalities were the second commonest ocular manifestation observed in 42% cases followed by posterior pole pallor seen in 39% cases. Thrombocytopenia was present in 108 patients out of 256 and retinal haemorrhages were commoner in patients having platelet count less than $50x10^3/\mu L$ (51%) as compared to patients with platelet count above $100 \times 10^3/\mu L$(14%).Incidence and severity of retinal manifestations was more with more severe grades of anaemia and with decreasing platelet counts. Ocular involvement was more common in megaloblastic anaemia followed by dimorphic anaemia and iron deficiency anaemia.

Introduction

Anaemia is the commonest haematological disorder presenting with variety of ocular manifestations.[1] Predominant features are conjunctival pallor and retinal haemorrhages although other parts of eyes can also be affected. Other retinal manifestations include venous and arteriolar tortuosity, cotton wool spots, macular star and papilledema. Their high incidence is correlated with severity of anaemia.[2] This study highlights the occurrence of ocular manifestations in anaemia, relation between incidence of retinal haemorrhages with severity of anaemia and need for fundus examination in anaemic patients.

Methodology

This is an observational, cross-sectional study carried out in the department of general medicine and ophthalmology of our institution. Institutional ethics committee clearance was obtained before

starting the study. Written, informed consent was obtained from all the patients. All those patients who attended principal investigator's medicine OPD or were admitted under him in medicine ward over a period of 1 year and were between 15 to 55 years of age were looked for clinical signs and symptoms of anaemia. Complete haematological work up was done for suspected anaemic patients. Patients with haemoglobin less than 12 g/dL were included in our study. Patients with diabetes, hypertension, and media opacities were excluded. Anaemia was classified according to haemoglobin levels as mild (10-12g/dL), moderate (7-9.9 g/dL) or severe (<7g/dL). Aetiology of anaemia was determined according to picture of peripheral blood smear and levels of Vitamin B12 in blood, serum ferritin, serum iron and total iron binding capacity.

All the patients were examined for ocular manifestations by an ophthalmologist. Visual acuity in both eyes were recorded using a standard Snellen's chart. Evaluation of anterior segment of eye was done to detect presence of lid oedema and conjunctival pallor by direct torch light or slit lamp bio microscope. Evaluation of posterior segment of eye was done to detect presence of retinal manifestations of anaemia (posterior pole pallor, flame shaped haemorrhage, Roth spot, dot-blot haemorrhage and disc oedema). This was done either by direct or by indirect ophthalmoscopy after full dilatation of pupil with tropicamide (mydriatic) eye drops.

Demographic data of patients were recorded, type and severity of anaemia was noted and ocular manifestations consistent with anaemia were recorded.

Results

In our study, total 256 patients, who had anaemia were included. Distribution of patients according to severity of anaemia is shown in Table 1. Conjunctival pallor was the most common manifestation present in 253 patients. Retinal changes were present only in patients of severe anaemia. Age group of patients range from of 15 years to 78 years. Distribution of retinal changes across various age groups is shown in Table 2.

Distribution of retinal changes according to aetiology of anaemia is shown in Table 3. Megaloblastic anaemia caused retinal changes in 92.85% of patients. In dimorphic anaemia patients, 32.85% had retinal changes whereas 33.33% of iron deficiency anaemia patients had retinal changes.

Table 1: Distribution of patients with ocular changes according to severity of anaemia

	Mild Anaemia	Moderate Anaemia	Severe Anaemia
Male	4	32	80
Female	12	20	108

Table 2: Retinal changes across various age groups in patients of severe anaemia

	15-25 years	26-35 years	36-45 years	46-55 years	>55 years
Male	4	0	9	11	24
Female	23	9	7	8	15

Table 3: Distribution of patients according to aetiology of anaemia

		Iron deficiency anaemia	Megaloblastic anaemia	Dimorphic anaemia	Anaemia of chronic disease	Autoimmune haemolytic anaemia
No. of Patients	Total	60	56	94	45	1
	With Retinal changes	20	52	28	4	1

Table 4: Distribution of ocular changes according to severity of anaemia

Ocular Changes		Mild anaemia	Moderate anaemia	Severe anaemia
Number of patients		16	52	188
Conjunctival Pallor		8	52	184
Retinal changes		0	4	104
Retinal changes	Posterior pole pallor	0	4	96
	Flame shaped haemorrhage	0	4	100
	Roth Spot	0	4	92
	Dot Blot Haemorrhage	0	0	8
	Disc Oedema	0	4	28

Table 5: Distribution of retinal changes according to severity of thrombocytopenia

	Platelet counts		
	$50x10^3/\mu L$	$50 – 100 \times 10^3/\mu L$	$100 \times 10^3/\mu L$
No. of Patients with retinal changes	16	56	36

In this study the retinal changes in the form posterior pole pallor, flame shape haemorrhage, Roth spot, dot blot haemorrhage and disc oedema were seen. (Table 4)

There has been slight female preponderance which is associated with severe thrombocytopenia with megaloblastic anaemia in females.

It was found that there is enhanced effect on manifestation of retinal haemorrhages when anaemia was present along with thrombocytopenia. In patients with severe anaemia and platelet count $<50X10^3/\mu L$, number of patients with retinal haemorrhages were statistically significant (P value <0.05) as compared to patients with severe anaemia and platelet count $>100x10^3/\mu L$ (P value 17.66).

Discussion

Severe anaemia of any cause is a known cause of retinopathy.[3]In the present study, most common manifestation of anaemia is conjunctival pallor followed by retinal changes and posterior pole changes. Retinal changes were associated with severity of anaemia and thrombocytopaenia. As the severity of anaemia increased and as platelet count reduced, severity in retinal changes increased.

Similar results were shown by MC Carraro et al.,[4] who found that anaemia causes retinopathy, especially when there is coexisting thrombocy-topenia. As the severity of anaemia increases, the risk of retinopathy increases, particularly when the haemoglobin level is below 6 gm/dL. In this study the retinal changes in the form posterior pole pallor, flame shape haemorrhage, Roth's spot, dot blot haemorrhage and disc oedema were seen.

A variety of pathologic changes occurring due to and associated with anaemia are implicated in the clinical features of anaemic retinopathy. Anaemia causes retinal hypoxia, which leads to infarction of the nerve fiber layer and clinically manifests as cotton wool spots. Retinal hypoxia also leads to vascular dilatation; increased transmural pressure owing to hypoproteinemia; and microtraumas to the vessel walls, which causes retinal oedema and haemorrhages. Erythropoietin may help in stimulating neovascularization.[5]

In many clinical situations, thrombocytopenia is associated with anaemia, and that leads to defective coagulation and haemorrhages. Other factors implicated in the pathology are venous stasis, angiospasm, increased blood viscosity (myeloproliferative disorders), hypotension (following haemorrhage), etc.[6]Other ocular changes in thrombocytopenia can include conjunctival petechial haemorrhages, amaurosis fugax, vascular occlusions, and retinal, vitreal and choroidal haemorrhages. These ocular

manifestations may be the initial indication of the underlying thrombocytopenia.[7]

Thrombocytopenia in vitamin B12 deficiency, is due to impaired DNA synthesis leading to ineffective thrombopoiesis. Vitamin B12 deficiency is also known to be associated with haemorrhagic manifestations as bleeding from skin, subcutaneous tissue, epistaxis and even threatening haemorrhage from gut as well as intracerebral bleed, requiring emergency blood transfusion.[8]Vitamin B12 deficiency anaemia also causes optic neuropathy, which is evident as disc pallor.[9]

Autoimmune haemolytic anaemia is characterized by antibodies against RBC components resulting in splenic sequestration and extravascular destruction. Retinal haemorrhages and severe macular detachments have been described in case reports.[10,11]

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