



PREVALENCE OF ANAEMIC RETINOPATHY AND OTHER OCULAR MANIFESTATIONS IN ANAEMIA PATIENTS

Dr. Karishma Aggarwal*

MBBS, Post Graduate, Department of Ophthalmology. *Corresponding Author

Dr. Inchara N

MBBS, M.S, Assistant Professor, Department of Ophthalmology.

Dr. Swati Kushwah

MBBS, Postgraduate, Department of Ophthalmology Institute- Sri Devaraj Urs Medical College.

ABSTRACT **Aims and objectives:** This study intends to describe the prevalence of various ocular manifestations of anaemia and its relation to severity of anaemia.

Materials And Methods: In this retrospective observational study the previous ocular records of 180 anaemic patients were assessed. Severity of anaemia was graded according to haemoglobin levels with 11-13g/dL for males and 11-12 g/dL for females as mild, 8-11 g/dL as moderate and less than 8 g/dL as severe for both. The incidence of all ophthalmic manifestations related to anaemia and their association with the severity of anaemia was estimated.

Results: In our study, 128 subjects (71.11%) had conjunctival pallor, 3 (1.67%) had subconjunctival haemorrhage, 35(19.44%) had retinal venous tortuosity, 28 (15.56%) had retinal pallor, 7(3.89%) had retinal haemorrhages, 12(6.67%) had cotton wool spots, 8 (4.44%) had Roth spots, 1(0.56%) had disc pallor and 9 (5%) had papilledema. 100% cases with severe anaemia had conjunctival pallor. Ocular manifestations increased with increase in severity of anaemia.

Conclusion: Conjunctival pallor and retinal venous tortuosity are the most common findings in a patient with anaemia but all cases of anaemia do not have ocular manifestations. Furthermore, the occurrence of ocular abnormalities is directly proportional to the severity of anaemia. Although the prevalence of anaemic retinopathy was low, it increased with the severity of anaemia.

KEYWORDS : Anaemia, Anaemic retinopathy, Conjunctival pallor, Roth spots

INTRODUCTION:

Blood disorders constitute one of the main health problems that presents with various clinical manifestations. Anaemia affects nearly one-third population of the world and is an important worldwide public health issue. Iron deficiency anaemia is responsible for most of the cases. It occurs commonly among undernourished societies of tropical and subtropical countries and the incidence has dramatically increased over the past decades.^[1] The clinical definition of anaemia includes blood haemoglobin (Hb) or haematocrit concentration less than the lower limit of the reference range appropriate to a person - Hb concentration <12 g/dL in females and <13 g/dL in males. The prevalence of anaemia in 16 to 70 years was 47.9%.^[2] The prevalence of anaemia is higher among females than males (50% vs. 44.3%) and much more in rural than urban areas.^[3]

In anaemics, as a consequence of hypoxia, there is impairment of tissue function; and so, symptoms of anaemia become visible in various systems of the body.^[4] The retinal metabolism is incapable of bearing deficiency of essential supplies which leads to hypoxic damage to the tissues ultimately. As the eye gives a direct window to detect the vascular changes in blood disorders, examination of the fundus can help in diagnosing and observing the evolution of a systemic disorder.^[5]

Ocular changes in anaemia can range from conjunctival pallor to retinal hemorrhages. Retinal changes including anaemic retinopathy, are well recognized complications of anaemia comprising of roth's spots, hemorrhages, soft exudates, intraretinal hemorrhages, retinal pallor, retinal hard exudates, dilatation of veins and optic nerve pallor. The precise mechanism for retinopathy is unclear, but appears to be connected to retinal hypoxia. Such changes usually occur in severe anaemia or thrombocytopenia. Hypoxic injury to the tissues leads to reduced capillary oxygenation, augmented capillary permeability, and finally extravasation of blood and its products.^[6] The ocular fundus derives its colour from retinal pigment epithelium (RPE), choroidal melanocytes, and blood in the retinal and choroidal vasculature. Normal retina is transparent. In patients with severe anaemia, the retina may look pale and the retinal vessels may be less red than normal.

Since iron plays an important part in myelin production, its inadequate intake causes hypomyelination and affects optic nerve function adversely.^[7,8] In addition to the usual changes, other defined findings comprise central retinal vein occlusion, retinal artery occlusion, disc edema, and anterior ischemic optic neuropathy.^[9,10]

The exclusive ophthalmoscopic findings are not pathognomonic of anaemias and may be revealed in other illnesses that involve the eye such as diabetes, hypertension, collagen vascular disease etc. However, occasionally the distribution and pattern of retinal findings in blood dyscrasias may be characteristic. If such findings are recognized on ophthalmoscopy, then additional investigations may expose a blood disorder that can help in early referral to the physician.^[11] The ophthalmologist may be the first to identify the hematologic effects of anaemia by noticing the typical changes in the fundus.^[12]

This study intends to describe the various ocular manifestations of anaemia in relation to its severity. Our study aims to observe the prevalence of ocular manifestations of anaemia as the early diagnosis of vision threatening ocular complications can lead to better understanding, awareness, and prognosis of the disease.

MATERIALS AND METHODS

Study Design: This retrospective observational study includes 180 patients of either sex and all ages above 18 years admitted in a tertiary care institute in Karnataka under the Department of Ophthalmology between May 2019 to May 2021, who underwent ophthalmological and blood workup like Complete Blood Count and had Hb concentrations < 12 g/dL in females and <13 g/dL in males, in view of elective cataract surgery.

Methods of Collection of Data:

The previous records of the patients included in the study were assessed. The records included findings of ocular examination using torch light and slit lamp bio-microscopy of the anterior segment; and fundus examination using direct ophthalmoscopy after pupil dilatation using mydriatics, (i.e., tropicamide). The necessary permission from the Ethical and Research Committee was obtained for the study.

Severity of anaemia was graded according to haemoglobin levels with 11-13g/dL for males and 11-12 g/dL for females as mild, 8-11 g/dL as moderate and less than 8 g/dL as severe for both.^[13] The incidence of all ophthalmic manifestations related to anaemia of such patients and their association with the severity of anaemia was estimated.

STATISTICAL METHODS

Ocular manifestations were considered as the primary outcome variables. Severity of anaemia (mild, moderate, and severe) was considered as the primary explanatory variable. For descriptive

analysis, the categorical variables were analyzed by using percentages and the continuous variables were analyzed by calculating the mean ± Standard Deviation. Data was also represented using appropriate diagrams like bar diagram, pie diagram, and stacked bar diagram. Categorical outcomes were compared between study groups using Chi square test. P value < 0.05 was considered statistically significant. Data was analysed by using coGuide software, V.1.03. (1).I. BDSS Corp. Released 2020. coGuide Statistics software, Version 1.0, India: BDSS corp.

RESULTS

A total of 180 subjects were included in the final analysis. Among the study population, males were 93 (51.67%) and females were 87 (48.33%) (Figure 1). Among the severity of anaemia, 40 subjects (22.22%) had mild, 92(51.11%) had moderate, and 48(26.67%) had severe anaemia. (Figure 2)

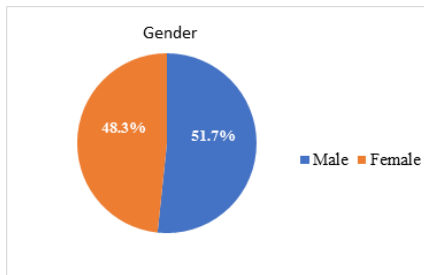


Figure 1: Pie chart of gender in the study population (N=180)

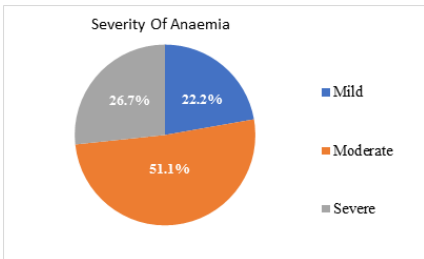


Figure 2: Pie chart of severity of anaemia in the study population (N=180)

Table 1: Descriptive analysis of ocular manifestations in the study population (N=180)

Ocular manifestations	Frequency	Percentages
Conjunctival pallor	128	71.11%
Subconjunctival haemorrhage	3	1.67%
Retinal venous tortuosity	35	19.44%
Retinal Pallor	28	15.56%
Retinal haemorrhages	7	3.89%
Cotton wool spots	12	6.67%
Roth Spots	8	4.44%
Disc Pallor	1	0.56%
Papilledema	9	5.00%

Table 1 displays the frequency of various ocular manifestations. In our study, 128 subjects (71.11%) had conjunctival pallor, 3 (1.67%) had subconjunctival haemorrhage, 35(19.44%) had retinal venous tortuosity, 28 (15.56%) had retinal pallor, 7(3.89%) had retinal haemorrhages, 12(6.67%) had cotton wool spots, 8 (4.44%) had Roth spots, 1(0.56%) had disc pallor and 9 (5%) had papilledema. The presence of conjunctival pallor was compared with the severity of anaemia and its frequency noted in each type as seen in Figure 3.

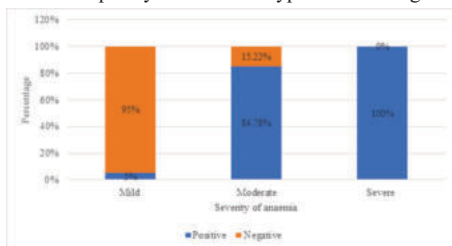


Figure 3: Staked bar chart of comparison of conjunctival pallor across severity of anaemia

In our study, on comparing the severity of anaemia with other ocular manifestations, only 2 subjects (2.17%) with moderate anaemia had subconjunctival haemorrhage and only 1 (2.08%) with severe anaemia. Retinal venous tortuosity was seen in 3 (7.5%) patients with mild anaemia, 14 (15.22%) patients with moderate anaemia, and 18 (37.5%) patients with severe anaemia. The difference in the proportion of retinal venous tortuosity between severity of anaemia was statistically significant (P value <0.001). Retinal pallor was observed in 3 (3.26%) patients with moderate anaemia and 25 (52.08%) patients with severe anaemia, Retinal haemorrhages were observed in 2 (2.17%) patients with moderate anaemia and 5 (10.42%) patients with severe anaemia. Cotton wool spots are seen in 12 (25%) patients with severe anaemia. Roth spots were seen in 1 (2.5%) patient with mild anaemia and 7 (14.58%) patients with severe anaemia. Disc pallor was seen in only 1 (1.09%) patient with moderate anaemia while papilledema was seen in 9 (18.75%) patients with severe anaemia. (Table 2).

Table 2: Comparison of Ocular manifestations across severity of anaemia

Ocular manifestations	Severity of Anaemia		
	Mild (N=40)	Moderate (N=92)	Severe (N=48)
Subconjunctival Haemorrhage	0 (0%)	2 (2.17%)	1 (2.08%)
Retinal venous tortuosity	3 (7.5%)	14 (15.22%)	18 (37.5%)
Retinal Pallor	0 (0%)	3 (3.26%)	25 (52.08%)
Retinal haemorrhages	0 (0%)	2 (2.17%)	5 (10.42%)
Cotton Wool Spots	0 (0%)	0 (0%)	12 (25%)
Roth Spots	1 (2.5%)	0 (0%)	7 (14.58%)
Disc Pallor	0 (0%)	1 (1.09%)	0 (0%)
Papilledema	0 (0%)	0 (0%)	9 (18.75%)

DISCUSSION

General manifestations of anaemia are because of: Reduced Hb concentration causing pallor of skin, conjunctiva, and nail beds; tissue hypoxia owing to scarce oxygen carriage leading to weakness, easy fatigability, exertional dyspnoea; and involvement of compensatory mechanisms like cardio-circulatory, biochemical and medullar which intend to increase cardiac output and oxygen delivery to the tissues. Ocular manifestations of anaemia are increasingly recognized. In our study, more males (51.67%) were found to be anaemic compared to females (48.3%). Whereas in a study by Nusrat et al., males and females were equal (50%:50%).^[14]

In a study by Lange et al, it was illuminated that haematological disorders can manifest in any ocular part including the adnexa of the eye. The commonest manifestations include conjunctival pallor and retinal changes but manifestations in the eyelids, anterior segment, optic nerve, orbit and adnexa are rare.^[15] In our study, the most common ocular manifestation in anaemic patients was conjunctival pallor, seen in the maximum number of patients (71.11%) and which was 100% in cases of severe anaemia. The second most common manifestation was retinal venous tortuosity (19.44%) followed by retinal pallor (15.67%). In the study done by Jakkal et al.,^[16] the most common manifestation was conjunctival pallor (100%) just like our study, but that was followed by fundus pallor (38.46%) and retinal haemorrhages (30.76%). Merin S et al.,^[17] in his study, showed that out of 89 patients, 20 (22.47%) had retinal variations, which were attributed to the anaemia. The changes included of diverse types of haemorrhages – dot-blot, splinter, flame-shaped, punctate, haemorrhages with pale centers, as well as soft exudates, cotton wool spots or hard exudates. In our study, only 3.89% had retinal haemorrhages and 6.67% showed exudates. Some studies have elaborated that propensity of retinal haemorrhages is increased if anaemia occurs along with thrombocytopenia.^[18,19]

Another study by Shitole et al.^[20] had consistent findings with ours with the most common manifestation being conjunctival pallor (100%), but the next commonest was retinal haemorrhage (37.50%) and then fundal pallor (31.25%) and Roth spots (18%) which was inconsistent with our study where Roth spots were present in only 4.44% and retinal hemorrhages in only 3.89%. In a study by Samya Singh et al.,^[21] disc pallor was found in 25 out of 150 patients (16.67%) and all patients had severe anaemia which could be because of generalised reduced Hb concentration but in our study only 1 (0.56%) patient with moderate anaemia showed disc pallor which can also be attributed as nutritional optics neuropathy.

Besides the above noted changes, a study showed that Central Corneal Thickness, Hexagonality of endothelial cells (HEX), and the thicknesses of all Retinal nerve fibre layer (RNFL) were significantly lower in the anaemic patients as compared to the control group and concluded that hypoxia may influence endothelial functions in the patients with anaemia.^[22]

On examining the fundus, both arterial and venous blood vessels are clearly visible, so they can be observed through an ophthalmoscope, inspected in detail with appropriate magnification by an ophthalmologist. The occurrence of ocular manifestations of anaemia depends on the severity of anaemia. Incidence and severity of retinal manifestations was more with more severe grades of anaemia. Normally, the ocular complications of anaemia are reversible with correction of anaemia. These patients should be monitored regularly with 3- 6 months follow-up. Eye being a window to systemic diseases, regular fundus examination helps in diagnosing the severity of anaemia.

Anaemic retinopathy has been linked to disorders pertaining to RBC elements. It has also been seen as a secondary manifestation of other systemic diseases. Therefore, it must be remembered that many other systemic diseases may be associated with comparable retinal findings and are not limited to anaemia per se.

Limitations of the study – As this was a retrospective study, the findings in the assessed data may be incomplete. A larger sample size is required for better estimation of the prevalence of anaemic retinopathy. Detailed blood examination to find the types of anaemia and specific correlation with ocular findings is missing.

CONCLUSION

Conjunctival pallor and retinal venous tortuosity are the most common findings in a patient with anaemia but all cases of anaemia do not have ocular manifestations. Furthermore, the occurrence of ocular abnormalities is directly proportional to the severity of anaemia. Although the prevalence of anaemic retinopathy was low, it increased with the severity of anaemia. Patients with moderate to very severe anaemia should undergo a fundus examination to diagnose these conditions. Early recognition of retinal manifestation helps in early intervention and, thus, an early resolution of retinal changes. On the other hand, ocular examination may identify the possibility of anaemia early and the patient can be referred for its timely appropriate management.

Conflict of interest

Nil

Financial statement

Nil

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