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Ocular Manifestations In Sickle Cell Disease – A Preventable Cause Of Blindness?

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Abstract:
Aim: *To study the co-relation between hematologic parameters and ophthalmic manifestations in patients of sickle cell disease (SCD).*
Methods : *This study was conducted in Acharya Vinoba Bhave Rural Hospital, JN medical College, Wardha. All the patients coming regularly to sickle cell O.P.D for follow up and those who were admitted for sickle cell crisis in medicine ward , obstetrics/gynecology patients who were found to be sickle cell positive (SS pattern) and pediatric patients diagnosed with sickle cell disease were included for this study. A total of 35 sickle cell disease (SCD) patients were studied. Hematologic investigations were done and ophthalmic investigations such as visual acuity, silt lamp bio-microscopy and fundoscopy was done and compared. For statistical analysis SPSS software was used.*
Results: *The study showed that 70% of the Sickle cell disease patients with hemoglobin 6 gm % or less had some ocular abnormality.*
Conclusion : *All sickle cell disease patients should have regular ophthalmic examination to prevent the risk of sickle cell retinopathy.*
Key words : *Sickle cell disease , SS pattern, sickle cell retinopathy*

I. Introduction

In India, haemoglobinopathies have been considered responsible for the largest number of genetic disorders and hence contribute to the imbalance in the health profile of the nation.

The cumulative gene frequency of haemoglobinopathies in India is 4.2%. With a population of over 1 billion and a birth rate of 28 per 1000, there are over 42 million carriers and over 12,000 infants are born each year with a major and clinical significant haemoglobinopathy. [4, 5, 6]

Despite being characterized by the same point mutation, the clinical course of Sickle Cell Disease (SCD) is extremely variable, ranging from mild to very severe depending on the different genotypes. [7, 8, 9, 10]

Painful crisis and severe hemolytic anemia are the two most common systemic complications. However, ocular manifestations are usually mild and asymptomatic. Ocular changes such as conjunctival sickling sign at the conjunctiva [11, 12, 13, 14] and iris atrophy have been noticed. Changes over the other vascular regions of the eye are seen in the choroid, optic disc, and the retina [15].Though nearly all structures in the eye are affected in Sickle cell disease but, the vision threatening problems are due to retinal neovascularization.[17,18]

Sickle cell retinopathy develops in up to 42% of individuals during the second decade of life. [16]

A complication of proliferative sickle cell retinopathy (PSCR) is a major contributor for vision loss and visual impairment in 10-20% of affected eyes. [19, 20, 21]

Micro-vascular occlusions being the most common cause of visual loss, it is logical then to assume that Sickle cell disease patients who suffer repeated episodes of vasocclusion are vulnerable to visual loss causing blindness. The number of patients who suffer vasocculsive crisis is unclear. The purpose of this study is to document early ocular abnormalities in sickle cell patients and to suggest the need for earlier ophthalmic screening.

II. Aims And Objectives

To study the ocular pathologies in sickle cell disease and correlate them with hematological parameters.

III. Methodology

Site Setting – This was a cross sectional study conducted in Acharya Vinobha Bhave Rural Hospital (A.V.B.R.H), a 909 bedded rural tertiary hospital of Datta Meghe Institute Of Medical Sciences(DMIMS) sawangi(Meghe), Wardha. The study was conducted over a period of 2 months, with due clearance of institutional ethical committee.

1. **Study Population** – All diagnosed cases of sickle cell disease (by Hb electrophoresis) in AVBRH were examined for ocular manifestations.

Sample Size – 36

Inclusion Criteria –

- Sickle cell patients who came for regular follow up/admitted for sickle cell crisis.

Exclusion Criteria –

- Anemias other than sickle cell disease.
- Patients with sickle cell trait, sickle cell thalassaemia and other genetic hemoglobinopathies other than sickle cell disease.

Procedure/Proposed Intervention

- All patients confirmed sickle cell on Hb electrophoresis were included in this study.
- Complete blood counts , Hemoglobin, red cell indices, white cell count and platelet count were done.
- Detailed ocular examination as follows: assessment of visual acuity using Snellen's chart. Anterior segment structure viz conjunctiva, cornea, iris and lens was examined using silt lamp examination.
- Indirect ophthalmoscopy were carried out for lesions in posterior segment.20 D lens was used to examine the peripheral retina.
- Fundus examination with binocular indirect ophthalmoscope and silt lamp biomicroscopy.78 D and 90 D lens was used in silt lamp biomicroscopy to examine optic disc changes and macular changes.
- Color photographs by fundus camera and fluorescien angiography (FFA) were done in cases with suspected proliferative sickle retinopathy. Goldberg classification was followed for classifying sickle cell retinopathy if present.

Statistical Analysis

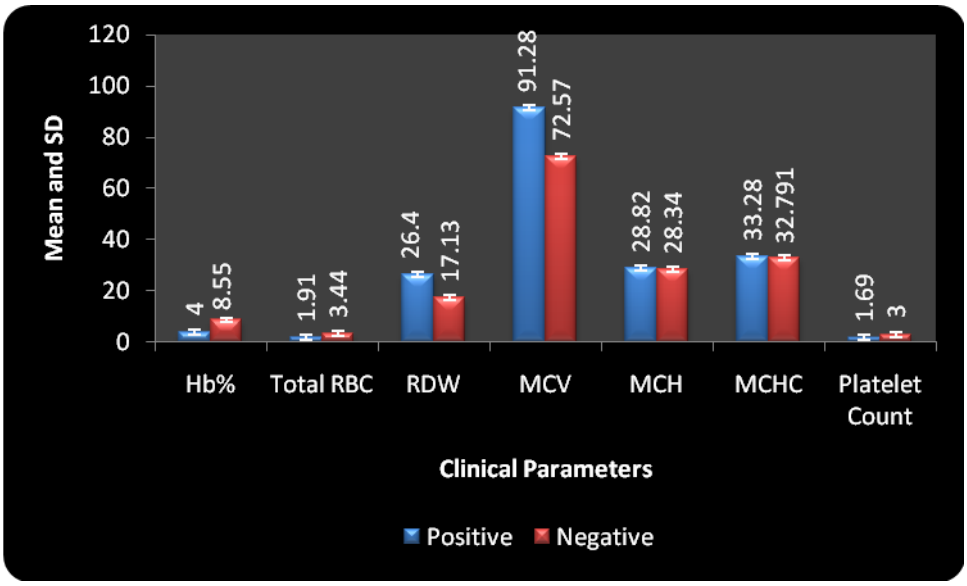
SPSS software was used for statistically analyzing the collected data and results obtained will be interpreted in the form of tables, graphs and charts.

IV. Observations And Results

Table 1: Comparison of parameters in positive and negative patients

Student's unpaired t test

		N	Mean	Std. Deviation	Std. Error Mean	t-value	p-value
Hb%	Positive	7	4.00	0.42	0.16	5.38	0.0001,S,p<0.05
	Negative	28	8.55	2.20	0.41		
Total RBC	Positive	7	1.91	0.77	0.29	4.50	0.0001,S,p<0.05
	Negative	28	3.44	0.81	0.15		
RDW	Positive	7	26.40	2.01	0.76	10.63	0.0001,S,p<0.05
	Negative	28	17.13	2.07	0.39		
Total WBC	Positive	7	2857.14	468.53	177.08	3.79	0.001,S,p<0.05
	Negative	28	7646.42	3297.64	623.19		
MCV	Positive	7	91.28	4.85	1.83	5.27	0.0001,S,p<0.05
	Negative	28	72.57	8.99	1.69		
MCH	Positive	7	28.82	2.84	1.07	0.29	0.76,NS,p>0.05
	Negative	28	28.34	4.05	0.76		
MCHC	Positive	7	33.28	1.66	0.63	0.54	0.58,NS,p>0.05
	Negative	28	32.791	2.22	0.42		
Platelet Count	Positive	6	1.69	0.11	0.04	2.79	0.009,S,p<0.05
	Negative	27	3.00	1.13	0.21		



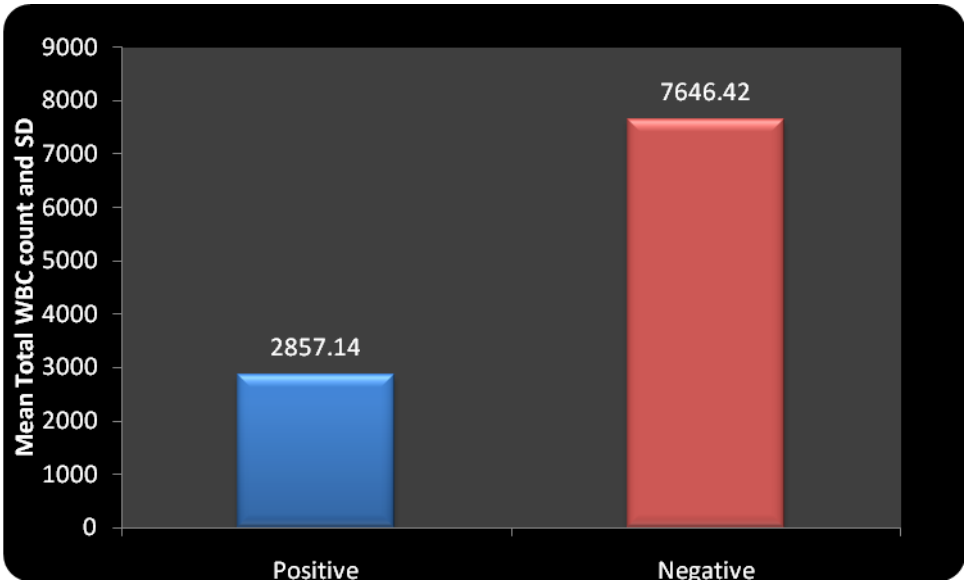


Table 2: Correlation of Hb% with other clinical parameters

Pearson's Correlation Coefficient

Parameters	Mean	Std. Deviation	N	Correlation 'r'	p-value
Hb%	7.64	2.70	35	-	-
Total RBC	3.14	1.00	35	0.64	0.001,S
RDW	18.99	4.27	35	-0.50	0.002,S
Total WBC	6688.57	3528.77	35	0.40	0.014,S
MCV	76.31	11.22	35	-0.53	0.001,S
MCH	28.44	3.81	35	-0.12	0.45,NS
MCHC	32.89	2.11	35	0.12	0.48,NS
Platelet Count	2.76	1.14	33	0.50	0.003,S

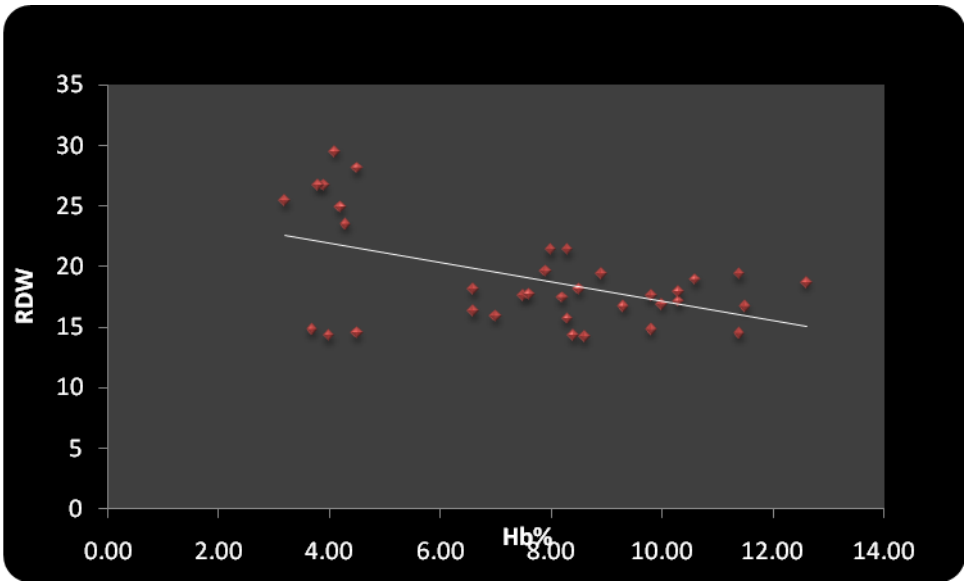


Table 3: Ocular Incidence According To Hemoglobin Concentration

Hemoglobin Range	Sickle Cell Disease		
	Total Cases	No. with Ocular Changes	%
Less than 6 gm% (Severe)	10	7	70
6 – 10 gm% (Moderate)	18	0	0
10 – 13 gm% (Mild)	8	0	0
Above 13 gm%	0	0	0

Table 4: Ocular Manifestations

Ocular Manifestations Fundus in General	Sickle Cell Disease	
	No. of Cases with Ocular changes n = 7	%
Major retinal vessel changes	2	28.57
Hemorrhages in periphery	4	57.14
Neovascularisation	1	14.28
Iridescent glistening vessels	-	0
Peripheral vessel deposits	-	0
Chorioditis	-	0

V. Discussion

Sickle cell haemoglobinopathy is a common disorder of this area. Irrespective of any ocular complaints, a search was made for ocular changes amongst the 36 sickle positive patients. Despite the fact that none of them had any ocular symptoms, but various ocular signs were found in them. All the patients except one who had been admitted for vision defect and was found to have neovascularisation.

Out of the 36 sickle positive patients, 26 cases (72.22%) were below 30 years of age, the youngest patient being 7 years old. There was one case of sickle cell anemia after 40 years. Seventeen patients were male and 19 were of the females (57.16%). Females were more affected than males. Goldberg et al and Condon et al had also observed such sex predilection in their cases. The caste distribution was majority were from religion buddha (61.11%), Teli (27.77%), goud (11.11%).

It should be noted that 70% of the Sickle cell patients were found with less that hemoglobin 6 gm % had some ocular changes. Pallor, icterus and vascular changes (90.47%) were observed in the conjunctiva. The vascular changes were of grade I and consisted of comma shaped or cork screw shaped or abnormally long, linear dilatations of vessels still connected to the vascular network with sludged flow, mostly observed in the bulbar conjunctiva covered by lids.

Kate et a1and Condon et al (97.4% in Hb-SS cases) have observed such changes in various degree in sickle cell anemia and sickle cell Hb-C disease other than sickle cell trait. Significant changes were observed in major retinal vessels (28.57%). The major retinal vessels were dilated, full and tortuous, the veins being more tortuous than arteries. In some cases, the arteries were pale and narrow. The peripheral vessels were tortuous and sometimes occluded, but in a few cases, the arterioles were chalky white in color, associated with perivascular sheathing, occlusion and tortuosity.

Similar findings have been documented by Condon et al, who found peripheral vessel disease 93.4% and major retinal vessel changes in 10.5% of Hb. SS cases; whereas Kate et a1have found venous fullness and venous tortuosity in 18% and 24% of their series. Hemorrhage (57.14%) and neovascularisation (14.28%) were also observed in the peripheral retina. Condon et al; had noted retinal hemorrhage (2.6%) and tortuosity and dilatations of capillary network with micro-aneurysmal formation and neovascularisation (39.5%) in the Hb-SS cases of his study, but Kate et al did not get any case of retinal hemorrhage in their series (instead they had observed vitreous hemorrhage in one case). Majority of cases with ocular involvement in all categories of haemoglobinopathies were within the third decades of life although highest incidence occurred in the second decade as observed in this study. Goldberg et al had observed the mean age for the ocular changes as 28 years, while Condon et al had seen maximum changes in 10-20 years. His study in Jamaica in elderly age groupsshowed that incidence of peripheral vessel disease appears to increase with age. Majority of cases of different haemoglobinopathies had ocular changes in moderate and severe degree of anemia (less than 6 gm. % of hemoglobin). But the comparison of the prevalence of ocular changes in different hemoglobin concentrations and in various haemoglobinopathies, of this study, indicates that besides anemia, the abnormal sickle hemoglobin is the prime cause for the ocular changes in this disorder (e.g. in 6-10 gm.% of hemoglobin range, indicating that simple anemia is not the only cause).

VI. Conclusion

Sickle cell disease is a disease of national concern. Its complication continue to remain as a significant issue to physicians.

Visual loss which occurs due to vasocculsive crises can be prevented in patients of sickle cell disease by early ocular diagnosis as it would seem, logical to assume that patients with SCD who suffer from repeated episodes of vaso-occlussion might be most vulnerable to ocular pathology.

Therefore, this study attempts to include ocular examination in routine investigation of sickle cell tests and in routine follow up check-ups in diagnosed cases of sickle cell disease. Thus, protecting them from visual impairment and visual loss.

References

[1]. Balgir RS 1996. The prevalence of sickle cell haemog-lobinopathy in India. In: TheEncyclopedia of Dravidian Tribes. Vol. 1 T.Madhava Menon, C Siva Thanu, K.P.Prasanth, M. Sasikumar and PRG Mathur (Eds.). Trivandrum: The International School of Dravidian Linguistics pp 21-29.

[2]. Bhatia HM, RaoVR 1987. Genetic Atlas of Indian Tribes. Bombay: Indian Council of MedicalResearch.

[3]. Shukla RN, Solanki BR 1958. Sickle cell trait in central India. Lancet, 297.

[4]. R. S. Balgir, "The Burden of Haemoglobinopathies in India and the Challenges Ahead," Current Science, Vol. 79, 2000, pp. 1536-1547.

[5]. R. S. Balgir, "The Genetic Burden of Haemoglobinopa- thies with Special Reference to Community Health in In-dia and the Challenges Ahead," Indian Journal of Hema-tology and Blood Transfusion, Vol. 20, 2002,

[6]. B. N. Shukla and B. R. Solanki, "Sickle Cell Anaemia in Central India," The Lancet, Vol. 271, No. 7015, 1958, p. 297.

[7]. Steinberg MH. Pathophysiology of sickle cell disease.Baillieres Clin Haematol. 1998;11(1):163–84

[8]. Steinberg MH, Adewoye AH. Modifier genes and sickle cell anemia. Curr Opin Hematol. 2006;13(3):131–6

[9]. Ballas SK, Kesen MR, Goldberg MF, Lutty GA, Dampier C,Osunkwo I, et al. Beyond the definitions of the phenotypic complications of sickle cell disease: an update on management. Sci World J. 2012:94-95

[10]. Gil GP, Ananina G, Oliveira MB, Costa FF, Silva MJ, Santos MN,et al. Polymorphism in the HMOX1 gene is associated with high levels of fetal hemoglobin in Brazilian patients with sickle cell anemia. Hemoglobin. 2013;37(4):315–24

[11]. Condom, PI, Serjeant, GR.Ocular findings in homozygous sickle cell anaemia in Jamaica.Am J Ophthalmol 1972, 73, 533-43

[12]. Nagpal, KC, Goldberg, MF, rabb, MF −Ocular manifestations of sickle hemoglobinopathies.Surv Ophthalmol 1977, 21, 391-411

[13]. Paton, D −The conjunctival signs of sickle cell disease. Br J Ophthalmol 1961, 66, 90-4.

[14]. Roy, MS, Rodgers, GP, Podgor, MJ, Noguchi, CT, Nienhuis, AW, Schechter, AN −Conjunctival sign in sickle cell anaemia: an in-vivo correlate of the extent of red cell heterogeneity.Br J Ophthalmol 1985, 69, 629-32.

[15]. Gagliano, DA, Jampol, ML, RABB, MF −Sickle cell disease. In: Tasman W, Jaeger EA,eds. Duane's clinical ophthalmology.Revised 1998 ed. Philadelphia: Lippincott Williams & Wilkins, 1996: Vol 3 chap 17:1-38.

[16]. Friberg TR, Young CM, Milner PF. Incidence of ocular abnormalities in patients with sickle hemoglobinopathies .Ann Ophthalmol. 1986;18(4):150–3

[17]. Penam A D, Serjeant G R.Recent advances in the treatment of proliferative sickle cell retinopathy. Curr Opnin Opthalmol 1992;17:29-33

[18]. Moriarty B J, Acheson R W, Condon PI, Serjeant GR.Patterns of visual loss in untreated sickle cell retinopathy. Eye 1988;2(pt 3):330—5

[19]. Condon PI, Serjeant GR. Behaviour of untreated proliferativesickle retinopathy. Br J Ophthalmol. 1980;64(6):404–11

[20]. Downes SM, Hambleton IR, Chuang EL, Lois N, Serjeant GR,Bird AC. Incidence and natural history of proliferative sicklecell retinopathy: observations from a cohort study.Ophthalmology. 2005;112(11):1869–75

[21]. Elagouz M, Jyothi S, Gupta B, Sivaprasad S. Sickle cell diseaseand the eye: old and new concepts. Surv Ophthalmol.2010;55(4):359–77

[22]. Ashley-Koch A, Yang Q, Olney RS. Sickle hemoglobin (Hb S) allele and sickle cell disease:A HuGE review. Am J Epidemiol. 2000;151(9):839-45.

[23]. Jackson H, Bentley CR, Hingorani M, Atkinson P, Aclimandos WA, Thompson GM. Sickle retinopathy in patients with sickle trait. Eye (Lond). 1995. 9 (Pt 5):589-93

[24]. Akinsola FB, Kehinde MO. Ocular findings in sickle cell disease patients in Lagos. Niger Postgrad Med J. 2004 Sep. 11(3):203-6.

[25]. Sokol JA, Baron E, Lantos G, Kazim M. Orbital compression syndrome in sickle cell disease. Ophthal Plast Reconstr Surg. 2008 May-Jun. 24(3):181-4.
[26]. Wisotsky BJ, Tesser PM, Schultz JS. Trabecular meshwork hemorrhage in a patient with sickle cell trait. Arch Ophthalmol. 1995 Mar. 113(3):381.
[27]. Babalola OE, Wambebe CO. When should children and young adults with sickle cell disease be referred for eye assessment?. Afr J Med Med Sci. Dec 2001. 30(4):261-3.
[28]. Gill HS, Lam WC. A screening strategy for the detection of sickle cell retinopathy in pediatric patients. Can J Ophthalmol. 2008 Apr. 43(2):188-91.
[29]. Emerson GG, Lutty GA. Effects of sickle cell disease on the eye: clinical features and treatment. Hematol Oncol Clin North Am. 2005;19(5):957-73, ix.
[30]. Goldberg MF. The diagnosis and treatment of secondary glaucoma after hyphema in sickle cell patients. Am J Ophthalmol. 1979;87(1):43-9.
[31]. Cook WC: A case of sickle cell anemia with associated subarachnoid heamorrhage.J Med 1930;11:541
[32]. Edington GM, Sarkies JWR: Two cases of sickle cell anaemia associated with retinal microaneuyrsms. Trans R Soc Trop Med Hug 1952:46:59-62)