Role of 'C' Reactive Protein, Haemoglobin, Red Blood Cell, White Blood Cell and Platelet in Sickle Cell Disease Patients of Tribal District

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Abstract

Sickle cell gene is widespread among many tribal and other general population groups in India. This disorder is recessive in nature. The heterozygous [HbAS] are absolutely asymptomatic but the homozygous [HbSS] suffer from serious complications leading to short life span. This may be due to vaso-occlusive crisis which occurs in HbSS patient. The present study aimed to assess the importance of CRP, WBC count, Haemoglobin, RBC and platelet count in sickle cell disease patient, measurement of these lifesaving parameters should be done as routine follow up for patient with sickle cell disease to increase awareness among these patient.

About 30 sickle cell patient attending sickle cell OPD run by pathology department at Shri Vasantrao Naik Govt Medical College Yavatmal are taken for the present study, their average age was 12 to 50 years. Any diagnosed case of sickle cell disease having CBC and HPLC already done and presenting in painful crisis were approached with a request to participate in our study. Less than 5 ml of blood is withdrawn from cubital vein of sickle cell patient in a plane bulb for CRP estimation. In this test highest dilution of serum showing agglutination 0.6 ml/dl is taken as highly sensitive

Comparison of above parameters in CRP positive and CRP negative HbSS and HbAS patients shows that the values of haemoglobin, RBC, WBC and Platelet are highly significant in CRP+ve HBSS patient as compare to CRP-ve HBAS pt.

Keywords: *Sickle cell disease, homozygous, heterozygous, C-reactive protein.*

Introduction

Yavatmalis located in the region of Vidarbha in the east central part of the state. In India, haemoglobinopathies, especially sickle haemoglobin is the commonest genetic disorder in the tribal belt of central and southern India. As the present study had been undertaken in Yavatmaldistrict, the patients suffering from Sickle cell disease, were may be migrants/residents of Vidarbha, Madhya Pradesh and Chhattisgarh state where high prevalence of Sickle cell gene has been found.[1,2]

Sickle Cell Disease is a genetic disorder characterise by haemolytic anaemia, vaso-occlusive crisis and progressive organ damage. Most patient with Sickle Cell Disease experience moderate to severe pain throughout their life time. [3]

Its clinical severity varies from the milder sickle cell trait (Heterozygous) to severe sickle cell anaemia (Homozygous). Variation in haemoglobin occurs due to substitution of glutamic acid by valine at position six of

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the beta chain of haemoglobin.

The clinical manifestations of sickle cell disease arises as sickle haemoglobin which tend to polymerise at reduced oxygen tension resulting in deformation of red cell into the characteristic rigid sickle shape, such inflexible RBCs cannot pass through micro circulation efficiently resulting in destruction of the red cell and intermittent vaso-occlusion. It causes anaemia, tissue damage and periodic episodes of pain and ultimately damages tissue and vital organs and may lead to death in early childhood or abnormal lifespan with complications.[4]

With this background our study was planned to assess the importance of CRP, WBC count, Haemoglobin, RBC and platelet count in sickle cell disease patient andto compare above parameters in Hb AS and Hb SS patients as CRP +ve and CRP –ve.

Material and Method

About 30 sickle cell disease patient attending sickle cell OPD run by pathology department at Shri Vasantrao Naik Govt Medical College Yavatmal are taken for the present study, their average age was 12 to 50 years. Any diagnosed case of sickle cell disease having CBC and HPLC already done and presenting in painful crisis were approached with a request to participate in our study.

The HPLC of the patient was done by variant haemoglobin testing system by biorad and complete blood count was done by MTHIC 18 cell counter at Shri Vasantrao Naik Govt Medical College Yavatmal.

A voluntarily willing patient was screened with all the inclusion and exclusion criteria for further recruitment. After filling all the required proformas, informed consent form, case record form, less than 5 ml of blood is withdrawn by cubital vein of sickle cell disease patient in a plane bulb for CRP estimation. This was done at microbiology department of Shri Vasantrao Naik Govt Medical College Yavatmal. Patient was not burdened financially for this.

For 'C' reactive protein high sensitivity slide test was done. In this test highest dilution of serum showing agglutination 0.6 ml/dl is taken as highly sensitive.

Statistical Analysis: Statistical significance is calculated by epi info two by two test and the values are highly significant P<0.0001 for RBC, WBC, Platelet P<0.007, Hb P<0.01 and CRP P<0.0009

Ethical Consideration:

1. Permission from institutional ethical committee was taken.
2. Proper written informed consent of patients was taken before starting study.
3. Right to withdraw from the study: patients have been given choice not to participate or to leave the study at any time. We have assured them that both participation in this study or refusal to participate will not have any bearing on the treatment of patients.
4. Confidentiality: All study records were kept confidential at all times. Patient's identity was not revealed except as required by law. The results of this study may be published for scientific purpose. Patient's identity will not be revealed in these publications

Findings

Table No. I

Parameter Hb	Decreased Hemoglobin	Normal Hemoglobin	Total
CRP positive	10	00	10
CRP negative	13	07	20
Total	23	07	30

CI = 95%, P< 0.01

Table I shows decreased and normal Haemoglobin in sickle cell disease patient who are C reactive protein positive and C reactive protein negative .the values are highly significant in CRP positive with decreased Haemoglobin.

Table No. II

Parameter RBC	Decreased RBC count	Normal RBCCount	Total
CRP positive	10	00	10
CRP negative	01	19	20
Total	11	19	30

CI = 95% P < 0.0001

Table II shows decreased and normal red blood cell count in sickle cell disease patient who are C reactive protein positive and C reactive protein negative, the values are highly significant in CRP positive with decreased RBC count.

Table No. III

Parameter WBC	Increased WBC count	Normal WBC Count	Total
CRP positive	08	00	08
CRP negative	02	20	22
Total	**10**	**20**	**30**

CI = 95% P < 0.0001

Table IIIshows increased and normal white blood cell count in sickle cell disease patient who are C reactive protein positive and C reactive protein negative, the values are highly significant in CRP positive with increased WBC count.

Table No. IV

Parameter Platelet	Increased platelet count	Decreased platelet Count	Total
CRP positive	10	00	10
CRP negative	08	12	20
Total	**18**	**12**	**30**

CI = 95% P < 0.0007

Table IV shows increased Platelet count [HbSS] and decreased Platelet count [HbAS]in sickle cell disease patients who are C reactive protein positive and C reactive protein negative, the values are highly significant in CRP positive with increased WBC count.

Table No. V

Parameter	CRP positive	CRP negative	Total
HBSS pt.	08	12	20
HBAS pt.	00	10	10
Total	08	22	30

CI = 95% P < 0.000

Table Vshows CRP +ve & CRP -ve in HBSS & HBAS patients and the values are highly significant CRP +HBSS patients as compare to CRP-ve HBAS patients

Table - I to V shows that the values of haemoglobin, RBC, WBC and Platelet are highly significant in CRP+ve HBSS pt.as compare to CRP-ve HBAS pt.

Discussion

In the Present study early detection of important parameter like CRP, WBC, RBC, Hb and Platelet count may plays important role in decreasing symptoms, increase awareness regarding the disease and increase life span of sickle cell disease patient. Increased C-reactive protein in HbSS patients with higher WBC, decreased RBC, Hb and increased platelet count may have an increased risk for vaso-occlusive crisis as compare to the C-reactive protein negative HbAS patients with normal WBC, Red blood cell, Haemoglobinand decreased platelet count.

Jowaireia Gaber et al[5] in their study have shown that there was strong association between increased C-reactive protein and increased White blood cell count for vaso-occlusive crisis, but in our present study increased C-reactive protein and WBC count with decreased RBC decreased Hb and increased platelet have life threating danger to the life of SCD pt.

It is seen that VOC results from the polymerisation of deoxy HbS leads to tissue ischemia which will lead to acute and chronic pain as well as organ damage that can affect any organ in the body including bones, joints, brain,eyes, liver, kidneys and lungs. VOC activates and damages the endothelial cells leading to inflammation & production of C-reactive protein. Polymerisation of the abnormal haemoglobin represents a key step in the pathophysiology of SCD. [6]

The factors such as acidosis,or increased erythrocyte 2,3-biphosphoglycerate, both of which lower oxygen affinity of red blood cells, will enhance the formation of deoxyhaemoglobin and, thereforewill promote intracellular polymerization and eventual sickling. In addition, sickling is highly dependent on haemoglobin concentration. Any pathophysiologic process which tends to pull water out of sickle RBCs will greatly increases their tendency to sickle. Thus the hypertonic environment of renal medulla can cause local sickling and the formation of papillary infarcts, even in individuals with sickle traits. While sickle cell disease patient have increased adherence to capillary endothelial cells, thereby increase the extent of polymer formation.[7]

In our present study decreased haemoglobin and red blood cell count may cause formation of deoxyhaemoglobin and therefore will promote intracellular polymerisation and sickling in HbAS pt. while HbSS red cells have increased adherence to capillary endothelial cells HbSS homozygotes have a severe haemolytic anaemia with increased haematocrit values.

Elevation in WBC count and haemoglobin levels

have been associated with developing acute pulmonary complications .VOC activates and damages the endothelial cells leading to inflammation, production of CRP is a part of a nonspecific acute phase response to inflammation and tissue necrosis . It may stimulate leucocyte migration, reacts with bacterial surfaces to facilitate phagocytosis signals an enhanced immune response induces lymphocyte blast transformation or enhances lymphocyte cytotoxicity.

Excessive haemolysis is a major pathogenic pathway in the development of pulmonary hypertension in SCD pt.El Kebir D[8] et al in their study stated that Platelets are essential for haemostasis but can also promote inflammation. Platelet activation is elevated in SCD pt. under steady state conditions and may increase in VOC. Activated platelet may promote the adhesion of sickle RBC to vascular endothelium by secreting thrombospondin and may contribute to thrombosis and pulmonary hypertension in SCD. Platelet can also bind to erythrocyte, monocyte and neutrophils to form aggregates.

Above parameter count is significantly increased in CRP +veHbSS patient as compare to CRP –ve Hb AS patient. Increased CRP level and WBC count may be an early predictor along with decreased haemoglobin, red blood cell count & increased platelet in Sickle Cell Disease patient.

Conclusion

Measurement of these biomarkers should be done as routine follow up for increasing life span of Sickle Cell Disease patient. We prompt further study in this regard.

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: Taken from institutional ethics committee.

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