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STUDY OF ASSOCIATION OF E-SELECTION AND HEMATOLOGICAL PARAMETERS IN PATIENTS OF SICKLE CELL DISEASE WITH "SS" PATTERN IN ONE OF THE TERTIARY CARE CENTRE OF CENTRAL MAHARASHTRA

Biochemistry

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ABSTRACT

Introduction: Sickle cell disease is one of the autosomal recessive genetic red cell disorder with a huge world wide distribution is sickle cell disease which is the result of point mutation in beta-globin gene codon 6 causing huge psychosocial burden. Many prognostic and diagnostic markers have been identified so far for sickle cell disease. This study is conducted to evaluate the role of circulating adhesive factor E-selectin and its association with the red cell indices.

Aim & Objectives: To find out the relationship between circulating adhesive molecule and haematological parameters (RBCs, TLC, Platelets, MCH, MCV) in sickle cell disease patients with HbSS pattern.

Material & Methods: This observational study was conducted in department of Biochemistry of J N Medical College, Sawangi, Wardha on 50 patients of SCD. We analyzed circulating adhesive factor E-selectin and haematological indices in 50 patients of SCD with HbSS pattern and compared the values with 50 control subjects.

Results: Mean E-selectin levels were significantly higher in HbSS subjects (77.95± 8.86) as compared to HbAA (31.97± 10.66) suggesting the role of sickle RBCs (SS-RBCs) in initiating and propagating the VOC (vasoocclusive crisis) events via adhesive interactions with the endothelium.

KEYWORDS

Sickle cell disease, Adhesive factors, haematological indices

Introduction:

It has recently been estimated that more than 7 million babies are born each year with either a congenital abnormality or a genetic disease. Five disorders constitute approximately 25% of these births, two of which haemoglobinopathy and glucose-6 phosphate dehydrogenase deficiency, are monogenic diseases.[1] Arguably the disorders which best represent how haematologists have faced the challenges posed by immigration haematology are the heamoglobinopathies, particularly sickle cell disease.[2]

Haemoglobin disorders were originally endemic in 60% of 229 countries, potentially affecting 75% of births, but are now sufficiently common in 71% of countries among 89% of births (either in the whole population or among minorities) to require policy-makers to consider the most appropriate strategy for treatment and prevention. Around 1.1% of couples worldwide are at risk for having children with a haemoglobin disorder and 2.7 per 1000 conceptions are affected. Annually there are over 332 000 affected conceptions or births. About 275 000 have a sickle-cell disorder, and need early diagnosis and prophylaxis. Due to spontaneous mutation, haemoglobin gene variants are present at low prevalence (carriers 1–1.5/1000) in all sizeable populations. They fall into two broad groups – structural variants that change the amino acid sequence and produce an unusual haemoglobin, and thalassaemias that lower or abolish production of globin chains.[3]

Though once considered a disease of childhood with a mortality approaching 20% by age 3, diagnosis soon after birth and advances in clinical research have placed current life expectancies, on average, at more than 48 years. Sickle cell disease is an inherited disease in which defective sickle-shaped red cells fail to carry adequate oxygen to tissues in the body. As a result of the sickling, the cells tend to block and damage the smallest blood vessels in the body, resulting in damage to organs served by those vessels.[4]

The average prevalence of Sickle cell disease in Vidarbha region was found to be 4.94%.[5] Wardha district which is one of the city of Vidarbha region of Maharashtra; prevalence of sickle cell disease was found to be 5.7% of which HbSS was 3.51% and that of HbAS was 2.1%. SCD is a very commonly found disease in this area and it is observed that among 100 admission roughly 5 are likely to have SCD. Most of the patients present are of less than five year age group.[6]

Previous studies by Omoti C.E. in 2005 & Ahmed G.S in 2010 has shown the most common symptom was due to Anemia, in patients of sickle cell disease.[7,8] There was statistically significant variation in the red cell indices of Sickle cell anemia patients.[9] Very few studies have been shown less commonly determined variables such as erythrocyte indices like MCV, MCH, MCHC, RBC count platelet counts & red cell distribution width in this region of central India.

The selectin family consists of three closely related cell surface molecules: L-selectin, E-selectin and P-selectin.[10] The prefixes (E-, P-, and L-) of the three selectins indicate the cell types where the molecules have been identified first: E-selectin on activated endothelial cells, L-selectin on leukocytes and P-selectin in the Waibel-Palade bodies of endothelial cells and in α-granules of platelets.[11]

We have conducted this study to evaluate the status of haematological parameters and circulating adhesive factor i.e. E-selectin in patients of sickle cell disease with HbSS pattern.

Aim& Objectives:

To find relationship between E-selectin and hematological parameters (Haemoglobin concentration, RBCs, TLC, Platelets, MCH, MCV, MCHC & RDW) in patients of sickle cell disease with HbSS pattern.

Material & Methods:

This study was conducted in the Department of Biochemistry, Acharya Vinoba Bhave Rural Hospital and Jawaharlal Nehru Medical College, Sawangi (Meghe) Wardha after Institutional Ethical Committee clearance. 50 sickle cell adult patients (Group-I) were taken from the sickle cell clinic of the hospital having haemoglobin pattern 'SS'. 50 age sex matched healthy subjects having sickling test negative included as controls in the study (Group II). The parameters analyzed were plasma soluble E selectin, hemoglobin, total RBC Count, total leukocyte count(TLC), platelet Count, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration(MCHC),red cell distribution width (RDW). To assess the degree of association between the variables studied, the Pearson correlation was used. The software used in the analysis was SPSS 17.0 version. The results were expressed as mean ± standard deviation (Mean ± SD). The results were represented in the form of tables and p< 0.05 was considered to be significant.

Results & Observation:

Maximum sickle cell patients were of the age group of 21 to 30 year.

Mean Haemoglobin level was significantly low in HbSS subjects (8.99±0.79) as compared to HbAA. Mean Total RBC counts were significantly lower in HbSS subjects (3.43± 0.68) as compared to HbAA. Mean Total leukocyte counts were significantly higher in HbSS subjects (12323.4± 1042.48) as compared to HbAA. Mean platelets counts (lac/ul) were significantly higher in HbSS subjects (3.23± 0.50) as compared to HbAA. Mean MCV was significantly lower in HbSS subjects (64.96± 4.11) as compared to HbAA.

Mean MCH was significantly lower in HbSS subjects (20.84± 3.90) as compared to HbAA (25.51± 4.79). Mean MCHC was significantly higher in HbSS subjects (34.65±3.80) as compared to HbAA. Mean MCHC was significantly higher in HbSS subjects (34.65±3.80) as compared to HbAA. Mean RDW levels were significantly higher in HbSS subjects (19.94± 2.57) as compared to HbAA. Mean E-selectin levels were significantly higher in HbSS subjects (77.95± 8.86) as compared to HbAA. Mean TLC, Platelet, RDW was showing significant ($P <0.05$) positive correlation with E-selectin whereas Mean MCV was showing significant ($p<0.05$) negative correlation with E-selectin in HbSS subjects.

Table 1: Correlation of E-Selectin (ng/dl) with other parameters in SS pattern

Parameters	Mean	Std. Deviation	N	Correlation 'r'	p-value
E Selectin (ng/dl)	77.95	8.86	50	-	-
Hb (gm%)	8.99	0.79	50	-0.003	NS, p>0.05
RBC (million/ul)	3.43	0.68	50	-0.237	NS, p>0.05
TLC (cell/ul)	12323.46	1042.48	50	0.787	S, p<0.05
Platelet (lac/ul)	3.23	0.50	50	0.922	S, p<0.05
MCV (fl)	64.96	4.11	50	-0.641	S, p<0.05
MCH (pg)	20.84	3.90	50	-0.239	NS, p>0.05
MCHC (g/DL)	34.65	3.80	50	0.155	NS, p>0.05
RDW (%)	19.94	2.57	50	0.359	S, p<0.05

Discussion :

In present study we have tried to understand the relationship between haematological aspects, and circulating adhesive factor in patients of sickle cell disease. The Mean haemoglobin & other haematological indices showed that sickle cell patients are suffering from moderate to severe anaemia. These results are in agreement to the previous studies by **Omoti C. E. (2005)** [8] **and Akinbami A. et al.(2012).**[12] Our study also showed that mean RBC count was significantly low in HbSS subjects as compared to HbAA subjects. The rate of chronic haemolysis associated with sickle cell anaemia patients could account for these lower values.[12] The SCA patients are continually haemolysing their red cells with a short survival rate of the erythrocytes between 12-14 days. Hence, the haemoglobin values are usually lower than normal healthy individuals.[8] Leucocytosis is associated with poor prognosis, while reducing neutrophil count is associated with good prognosis also leucocytosis in sickle cell disease patients may be due to auto splenectomy resulting from recurrent splenic vessels occlusion, which make patients more vulnerable to overwhelming infections particularly, encapsulated organisms like S. pneumonia and H. influenza.[12] Higher levels of soluble E-selectin in Sickle cell patients were also noted in our study. Highly raised plasma E-selectin levels in HbSS subjects could be due to high susceptibility of SS-RBC to get adhered to endothelial surface of vessels.[13] There are few limitation of this study it is an observational case control study therefore there is a distinct possibility that a proportion of the patients may not have given a true reflection of their physical and clinical conditions along with their environmental and family background, personal habits and practices or unknown confounding could be a source of bias.

Conclusions:

The haematological parameters showed that haemoglobin concentration, total RBC count, MCV and MCH were decreased in HbSS subjects as compared HbAA. Whereas Total leucocyte count, Platelet count and Red cell distribution width were significantly increased in HbSS as compared to HbAA. In HbSS subjects it was found that E-selectin was showing significant positive correlation with TLC, Platelet and RDW whereas it was showing significant negative correlation with MCV.

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