SUMMARY

Sickle cell disease refer to a genetic blood disorder characterized by a hemoglobin variant called HbS and Clinically Characterized by chronic hemolysis, intermittent vaso-occlusive event and increased susceptibility to infection. Due to autosomal inheritance it may present itself either in milder heterozygous or in severe homozygous form. In homozygous (Hb SS) form all hemoglobin is present in sickle hemoglobin. In heterozygous (Hb AS) form up to 40% of Hb is sickle hemoglobin. In sickle cell anemia glutamine substitute valine at position 6th of beta hemoglobin chain, the substitution of glutamine, a positively charged amino acid for a neutral amino acid valine results in the formation of hemoglobin S. Hb S is more unstable than normal Hb because the former release high amounts of reactive oxygen species (ROS) \((O_2, H_2O_2, HO)\) and has reduced antioxidant capacity. This imbalance leads to oxidative stress. In other words oxidative stress defined as result of imbalance between the oxidant and antioxidants in favor of the former. Increased production of oxidants and/or decreased availability of antioxidants trigger, a cascade of oxidative reaction damaging lipid, protein and DNA ultimately leading to (premature) cell death. Under normal condition there is balance between reactive oxygen species and defense system of antioxidants like Superoxide dismutase (SOD), Catalase (CAT), glutathione Peroxidase (GPx), Glutathione, flavenoids and caroteniods, there by preventing or limiting oxidative damage.
The present study has been carried out in 300 subjects out of which 200 were sickle cell anemia and 100 were considered as healthy subjects. The SCA group is divided into two group, Group II Sickle cell disease (homozygous) and group III sickle cell trait (Heterozygous). We have selected the patients of both group age group between 10-40 years. The blood samples of all subjects were analyzed for exogenous and endogenous antioxidants and hematological profile. The inflammatory marker CRP was also measured. The blood samples were collected from the area prone for SCD like Chhattisgarh and south region of Madhya Pradesh. All the data were analysed using SPSS 16 (SPSS, Inc, Chicago, IL) and Excel (Microsoft Corp., Redmond, WA). The data are expressed as mean± sd. The statistical comparisons were performed by means of independent samples t test. Multiple linear regression models.

In SCA Group following are the outcomes:

- The hematological profile Hb and RBC were significantly decreased while HCT and MCV were not significantly changed in homozygous as compared heterozygous and control subjects.

- In heterozygous group hematological profile showed significant change in all parameters as compare to control group but all parameter were in normal range in both sex.

- The total leukocyte count significantly increased in Hb SS group as compare to both Hb AS and Hb AA group.
The antioxidant enzymes CAT, GPx and GR were significantly decreased except SOD in SCA group in both sex. As compared to controls as sickle cell anemia produces greater amount of reactive oxygen species (ROS).

The GSH level also decreased significantly in SCA group as compared to controls. This indicates higher oxidative stress in cell.

The antioxidant vitamin E, C and Beta carotene were significantly decreased in SCA group as compared to controls.

Total antioxidant capacity (TAC) was also estimated, TAC values were more informative than the knowledge of individual antioxidants. TAC was significantly decreased in SCA patients as compared to control subjects.

MDA is a biomarker of damage caused by ROS derived from lipid peroxidation of membrane. It was significantly increased in both group i. e. Homozygous (Hb SS) and heterozygous (Hb AS) as compare to control subjects but in the Homozygous (Hb SS) group it is more significantly increased than heterozygous (Hb AS) group. This indicates Sickle cell anemia, produces greater amount of reactive oxygen species and has reduced antioxidant capacity which leads to oxidative stress. Reactive oxygen species can cause significant damage to biomolecules.
Summary

since membrane lipids readily react with ROS resulting in lipid peroxidation.

➢ The CRP level was significantly increased in SCA patients as compared to controls but in homozygous group it is more significant as compared to heterozygous group. Higher level of CRP in SCA indicate a covert inflammatory response, despite the absence of crisis.

➢ A significant negative correlation was found between CRP and Hb and positive correlation with WBC in SCA group.

➢ Further, CRP was positively correlated with MDA while negative correlation was found with TAC.

➢ The group II (Hb SS) subjects both male and female showed more significant change in hematological and biochemical parameters as compared to group III (Hb AS). This indicates the homozygous subjects are more prone to oxidative stress than heterozygous subjects.

It is therefore, concluded that SCA is also a chronic inflammatory disorder and decrease exogenous and endogenous antioxidant are suggestive of oxidative stress in sickle cell disorder.