Chemiluminescence techniques for granulocytes functional activity and study of oxidants and antioxidants in patients with sickle cell anemia

A thesis

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Abstract

Sickle cell anemia is one of the highly distributed hereditary diseases . Which is also associated with increased oxidative stress. Hence this study is an attempt to evaluate the levels of some oxidants in patients with sickle cell anemia and comparing them with those of healthy subjects for example the ROS generated from the functional activity of granulocytes using luminol dependent CL. of whole blood . Estimation of MDA level was also done in serum which is used as a biomarker of lipid peroxidation .

GSH which is the most important antioxidant in the blood was also evaluated .

In addition to estimate some hematological parameters : Hb , PCV , WBC count and number of granulocytes .

We tried to find the possible interaction among the hematological and biochemical parameter studied by the correlction.

The study was carried out in two major groups of population : Sickler patients group (184), which was divided into two subgroups: Sickler adults (112) within the range of age (17-38 yrs) and sickler children (72) within the range of age (8-15 yrs) . Then sickler patients were also further divided into :- Sickle cell trait patients (Hb AS patients) and sickle cell disease patients (Hb SS patients) .

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The second major group include : (176) healthy subjects. The major group which is further divided into healthy adalts (120) within the range of age (17-43 yrs) and healthy children (57) within the range of age (10-15 yrs).

The results showed that there are high significant differences in the level of GSH concentration between the two major groups healthy and sickler patients in general ($P < 0.01$) (13.97 ∓ 2.78 VS 11.25 ∓ 3.90) , between healthy and HbAS patients ($P< 0.01$) , (13.97 ∓ 2.78 VS 12.08 ∓ 3.93) and between healthy and HbSS patients ($P<0.01$) , (13.97 ∓ 2.78 VS 3.50 ∓ 9.61) .

The results also showed that there are high significant differences in MDA level between healthy and sickler patients in general (0.22 ∓ 6.31 VS 0.79 ∓ 0.45) , between healthy and HbAS patients (0.22 ∓ 6.31 VS $0.86 \mp .45$) and between healthy and HbSS patients (0.22 ∓ 6.31 VS 0.78 ∓ 0.46) , ($P< 0.01$) .

The same findings are reported when comparing the activity of granulocytes to generate ROS between each two groups above i.e :- Significant differences are between healthy and sicklers (10.68 ∓ 5.1 VS 15.69 ∓ 5.44) ($P< 0.01$) , between healthy and HbAS patients (10.68 ∓ 5.1 VS 16.37 ∓ 5.88) and between healthy and HbSS patients (10.68 ∓ 5.1 VS 10.37 ∓ 5.40) ($P< 0.01$) .

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It was found that there are high significant negative correlation between each of :- GSH and MDA level, Hb concentration and MDA level , Hb concentration and granulocytes functional activity to generate ROS ($P< 0.01$) and there is significant negative correlation between GSH and granulocytes functional activity to generate ROS ($P< 0.05$) .

But the correlation between granulocytes functional activity and MDA level was high significant positive correlation ($P< 0.01$) .

It has been concluded that sickler patients in general have higher granulocytes functional activity to generate ROS and significantly than the healthy subject regardless to the clinical complications and higher MDA level than the healthy. Also the ability of sickler patients to produce antioxidants including GSH was lower than the healthy subjects.