SERUM LACTATE DEHYDROGENASE IN SICKLE CELL ANAEMIA IN ILE-IFE; NIGERIA

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SUMMARY

Ogunleye I. O. Adekile A.D. Akintoye S and Fakunle J.B. Serum Lactate Dehydrogenase in Sickle Cell Anaemia in Ile-Ife, *Nigerian Journal of Paediatrics* **1991: 18(1):** 28–31 Chronic Haemolysis and Tissue Necrosis are two common feeatures of sickle cell disease In this study, lactate dehydrogenase (LDH) was used as an enzyme marker, since the enzyme has been frequently employed as a diagnostic tool in diseased states associated with tissue destruction.

Mean activities of 230.8 ± 22.4 u/L and 145.8 ± 13.3 u/L were obtained for serum lactate dehydrogenase in our paediatric patients with sickle cell anaemia (SS) and sickle cell trait (AS) respectively. These mean activities were significantly higher ($P < 0.05$) than the mean obtained for age matched healthy control individuals with haemoglobin AA profiles (134.2 ± 11.4 u/L). Also the mean activity obtained for sickle cell trait was significantly ($P < 0.05$) lower than the mean activity obtained for the homozygotes (SS).

The heat stability results in this study suggest that liver necrosis may be a major contributory factor for the elevation of LDH. The results are in agreement with the earlier reports that haemolysis and liver necrosis are responsible for the elevation of the enzyme.

INTRODUCTION

THE diagnostic significance of serum LDH in disease associated with tissue destruction of various types is well documented.[1–3] Although the red cell is a rich source of LDH, many investigations have shown that the serum activities of the enzyme are only slightly or moderately elevated in haemolytic anaemias. Marginal increases have been associated with thalassaemia and sickle cell disease but a profound elevation has been reported in megalobiaetic anaemia.[4–8] While in megaloblastic anaemia the high serum values of the enzyme was attributed to the release of the enzyme from marrow megaloblasts in sickle cell disease it was suggested that the elevation is probably due to chronic haemolysis and hepatic necrosis.[4, 8]

Few reports are available concerning the measurement of serum LDH activity in African SS patients. Adebonojo et al[9] repoted serum LDH values in American SS patients. The present study was, therefore, undertaken to estimate the serum level of LDH in SS patients in our centre and to compare the values obtained with sickle cell trait (AS) and healthy individuals (AA).

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MATERIALS AND METHODS

Blood was obtained by venepuncture from children with sickle cell anaemia attending the sickle cell clinic of the Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife. These were children with SS haemoglobin electrophoretic profiles and were in steady state at the time of the study. Blood samples from apparently healthy children with AS haemoglobin electrophoretic profiles and children with AA profiles were obtained from the same hospital. The serum in each case was immediately separated from the red cells by centrifugation, ensuring that no haemolysis or red cell contamination of the serum occurred.

Lactate dehydrogenase was assayed as earlier reported.[10] Heat stability study on the serum samples was carried out using the methods of Wroblewski and Gregory.[11] All samples were analysed in duplicate and the average value was taken for each sample.

Results were expressed as mean ± standard deviation and the student's test was used to determine the significance of differences between mean values.

RESULTS

There were 41 children (25 males and 16 females) with AA profiles aged between 4 and 16 years (mean age 9 years), whose serum samples served as control for this study. There were 13 children (6 males and 7 females) with SS profiles aged 4 and 16 years (mean age 10 years) and 18 children (10 males and 8 females) with AS profiles aged 4 to 16 years (mean age 9 years) in this study. The results obtained are summarized in Tables 1–4.

Table 1

SERUM LDH ACTIVITY IN THE HEALTHY CHILDREN (AA HAEMOGLOBIN ELECTROPHORETIC PROFILE)

Age range (years)	mean age (years)	Number	Mean LDH activities (U/L)
≤5	4	9	159.7 ± 12.8
6 – 10	8	10	148.9 ± 10.7
11 – 15	13	12	138.1 ± 8.4
≥16	16	10	121.5 ± 7.8

Overall mean ± SD. = 134.2 ± 11.4 U/L

Table II

SERUM LDH ACTIVITY IN CHILDREN WITH SS HAEMOGLOBIN ELECTROPHORETIC PROFILE

Age range (years)	mean age (years)	Number	Mean LDH activities (U/L
⩽5	4	3	222.2± 18.5
6-10	8	3	259.3± 9.3
11-15	13	5	284·9± 8.3
⩾16	16	2	215.2± 6·9

Overall mean ± SD =230·8 ± 22.4

Table III

LDH ACTIVITIES IN CHILDREN WITH SICKLE CELL ANAEMIA (SS) AND CHILDREN WITH SICKLE TRAIT (AS) AND CONTROL (AA) CHILDREN

Haemoglobin electrophoretic profite	Age range (years)	Mean age (years)	Number	Mean LDH activities (U/L)
AA	4–16	9	41	134.3± 11.4
AS	4–16	10	18	145.8± 13.3
SS	4–16	9	13	230.8 ±11.2

Table IV

HEAT STABILITY STUDY ON SERUM LDH ACTIVITIES IN AS, SS AND AA CHILDREN

	AA	AS	SS
Mean activity of serum LDH (25°C	134.3	145.8	230.8
Mean activity of LDH (57°)	129.8	143.8	94.5
Heat stability index	0.96	0.98	0.40

The mean activity of serum LDH in SS children was significantly higher ($P < 0.05$) than the mean activity for AS and AA children. No significant difference ($P > 0.05$) was found between the mean activities of AS and AA children. However, the mean activity for AS children fell between the mean activities for AA and SS children. The mean activity for the SS children was almost twice the mean activity of the AA children (Table 3). Comparing individual serum LDH activity in the SS patients with mean activity in the healthy control (AA), a great number of the SS patients had serum LDH activity above 160% of the control value (Table 2). There was a gradual decrease in serum LDH activity with age in the AA children (Table 1). However, it is difficult to speak validly on age-related trend in serum LDH activity in AS and SS children because of small numbers of children in these groups.

Table 4 shows the heat stability indices for serum LDH in healthy control (AA), sickle cell trait (AS) and sickle cell anaemia (SS). The high indices obtained for AA and AS children suggested that the serum LDH in these children was the heat stable fraction, whereas the serum LDH in SS children was mainly the heat labile (hepatic) fraction which had low heat stability index.

DISCUSSION

Majority of the SS children had their serum LDH values well above the mean for the AA children. The mean value for the AS individuals fell between the means for the AA and the SS. This agrees with the findings previously reported by Adebonojo[9] in which the serum LDH activity of children with AS haemoglobin profiles fell between the AA and SS values.

It has been reported that haemoglobin values of children with AS profile is similar to those with AA profile[12,13] and this probably explains why the levels of serum LDH in AS children were not very different from the levels in AA children. Our findings agree with this observation since there was no significant difference between the mean serum LDH activities for AS and AA profiles in this study.

Adebonojo[12] and Heller et al[1] merely suggested that there may be varying degrees of heamalysis with the different variants of sickle cell disease (SS, SC and S-Thal) and that hepatic necrosis may also contribute to the elevated serum LDH level seen in these patients. The contribution of hepatic LDH to the overall elevated serum activity was demonstrated in this study by employing the heat stability method.[11] Results of the heat stability study suggested that hepatic LDH probably contributed more to the overall serum LDH level in SS children than in either AA or AS children. This finding is in keeping with the fact that the hepatic necrosis in these SS children could easily lead to the efflux of hepatic LDH which is localized in the soluble fraction (cytosol) of the cell. It is evisioned that further analysis of serum LDH will elucidate the absolute contribution due to the hepatic LDH isoenzyme.

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