Uric Acid, Creatinine and Urea in Normal, Glucose-6-Phosphate Dehydrogenase-Deficient and Hb SS Saudi Subjects

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It has been reported that sickle cell anemia patients have elevated serum levels of uric acid [1, 2]. This has been ascribed to altered renal function or increased bone marrow activity [3, 4]. The majority of investigations have been carried out on subjects of African or West Indian origin. Hemolytic anemias such as sickle cell disease and glucose-6-phosphate dehydrogenase (G6PD) deficiency are known to be prevalent in the eastern province of Saudi Arabia. Perrine et al. [5] reported that due to high fetal hemoglobin, Saudi sickle cell anemia takes a benign clinical course. A slightly elevated uric acid level has been reported earlier in Saudi sickle cell patients, which proved to be statistically insignificant [6]. However, the investigators did not appraise the high prevalence of G6PD deficiency in this area, where it is also common in sickle cell disease subjects. Therefore, we have sought to establish the levels of uric acid, urea and creatinine in normal, homozygous sickle cell disease (Hb SS) and heterozygous sickle cell trait (Hb AS) subjects, with or without G6PD deficiency.

Blood samples were collected in EDTA or heparin tubes from Saudi volunteers or patients from the eastern province attending Qatif Central Hospital (age range 5-25 years) and were analyzed within a 4-hour period. Hematological indices (Cell DYN 700, Sequoia Turner), cellulose acetate hemoglobin electrophoresis (Helena Laboratories, Beaumont, Tex., USA), uric acid, creatinine and urea were determined using standard procedures. G6PD activity was determined spectrophotometrically according to the method of Bat-tistuzzi [7]. All subjects were in a clinically steady state and the Hb A₂ level and reticulocyte counts were determined to exclude the possibility of active hemolysis or the presence of the β -thalassemia trait [8]. Statistical analysis was carried out by Student's t test and ANOVA.

679 blood samples were obtained from subjects of both sexes who did not exhibit active hemolysis, β -thalassemia or show any history of favism. Table 1 reports the hematological indices determined on both heterozygous and homozygous sickle cell subjects with or without G6PD deficiency. The indices for normal controls are similar to those reported in

other populations [9]. It is of interest, however, that Hb SS with or without G6PD deficiency has a mean hemoglobin concentration of 10.3 ± 1.8 and 10.9 ± 1.1 g/dl, respectively, values which are higher than those reported for other populations (table 1).

The mean level of uric acid in normal control subjects ($n = 34$) was 0.234 mmol/l, which agrees with values reported in other populations [10]. In a group ($n = 23$) of G6PD-deficient subjects, the mean value for uric acid was 0.239 mmol/l, which is comparable to normal controls. There was also an insignificant difference ($p > 0.05$) between the mean values of uric acid determined for Hb AS ($n = 21$) and G6PD-deficient Hb AS ($n = 21$) subjects of 0.237 and 0.239 mmol/l, respectively, and that of normal controls (table 2). Moreover the mean levels of uric acid in a group of Hb SS ($n = 29$) and G6PD-deficient Hb SS ($n = 20$) of 0.229 and 0.226 mmol/l, respectively, were also comparable to normal controls.

The mean values for creatinine and urea were also determined and are comparable to values in the literature (table 2).

Hyperuricemia has been reported to be a common feature of homozygous sickle cell disease, occurring in 41% of patients [13-15]. This has been attributed to the markedly increased red cell turnover and decreased renal

Table 1. Hematological indices of blood from heterozygous and homozygous sickle cell anemia and normal Saudi Arabian subjects with and without G6PD deficiency

Table 2. Level of uric acid, creatinine and urea in subjects with sickle cell anemia and control subjects with and without G6PD deficiency

excretion. Our data clearly suggest that Saudi sickle cell patients have no elevation in serum uric acid during their first three decades of life, and are clinically free of the symptoms that are usually associated with hyperuricemia. This is consistent with the fact that Saudi sickle cell disease takes a benign course when compared to that of other populations [9].

Association of G6PD deficiency with Hb SS did not influence the level of uric acid, as shown by our results. An earlier report on the Saudi population showed a slight increase in uric acid levels [6]. The difference between our results and this report might be attributable to the age of the subjects included in the previous study (4-45 years).

Values for creatinine in both Hb AS and Hb SS without enzyme deficiency were lower than in normal control ($p < 0.05$). These values are in close agreement with those reported elsewhere [6,13]. However, in Hb AS and Hb SS subjects with G6PD deficiency, the mean levels of creatinine were significantly higher than in subjects without enzyme deficiency ($p < 0.05$). This slight elevation is reported here for the first time and therefore cannot be compared to values of their counterparts in other populations.

The differences in the levels of serum urea in Saudi hemoglobinopathic groups were statistically insignificant when compared to the control group. These results differ from those reported in other populations [15]. However, consideration must be given to the fact that diet influences plasma urea and creatinine levels. Therefore, further in-depth investigations are required.

These results are important in view of the high incidence of sickle cell anemia and G6PD deficiency or a combination of these defects in our region. It will assist in the correct interpretation of hyperuricemia and glomerular insufficiency, which is reported to be common in homozygous sickle cell disease.

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