Erythrocyte Glucose 6 Phosphate Dehydrogenase Deficiency and Neonatal Jaundice

Pages with reference to book, From 259 To 260

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Abstract

Four years data from Special Care Baby Unit revealed neonatal jaundice (NNJ) as the commonest cause of hospitalization (1944 cases of NNJ out of 6454 admitted neonates). Majority (47.5%) of babies with NNJ presented between 4-7 days of birth. One hundred and sixty infants with NNJ were positive for Glucose 6 Phosphate dehydrogenase (G6PD) deficiency, of whom 153 were males and 7 females. Eighty five G6PD deficient babies required exchange transfusion and 23 developed bilirubin encephalopathy (BE) of which 7 died. (JPMA 45:259, 1995).

Introduction

Glucose 6 Phosphate Dehydrogenase (G6PD) deficiency is the most important disease producing enzymatic defect leading to hemolytic anaemia. This enzymopathy is a public health problem throughout the world. Approximately 7.5% of world population carry one or two genes for G6PD deficiency and 2.9% are genetically deficient for the enzyme[1]. More than 300 genetic variants of G6PD have been described in association with a wide spectrum of hemolytic anaemia[1,2]. G6PD deficiency as a causative factor for NNJ[3] has a definite and unquestioned association with NNJ[1-3] . An inverse dose response relationship between G6PD activity and neonatal jaundice has been reported among male infants[4]. Since a large number of neonates with NNJ are seen in hospitals, so this study was conducted to assess the role of G6PD deficiency in the etiology of NNJ and evaluate the associated morbidity and mortality.

Patients and Methods

Hayat Shaheed Teaching Hospital Peshawar, North West Frontier Province (NWFP), Pakistan, is a tertiary care referral center receiving patients from all parts of NWFP. Medical records of neonates admitted to the Special Care Baby Unit (SCBU) during 4 years (October 1988-October 1992) were retrospectively retrieved and analyzed. Babies admitted with NNJ requiring treatment (Phototherapy and exchange transfusion) were included in the study. All infants with NNJ were screened for ABO incompatibility. Rh in compatibility and G6PD deficiency. Enzyme assay for G6PD was carried out on fresh whole blood using semi quantitative, visual calorimetric Assay (Sigma Diagnostics) based on method described by Motuisky and Campbell-Kraut[5] and modified by Bernstein[6] and Ells[7]. Treatment decisions for phototherapy or exchange transfusions were made on the basis of indirect serum bilirubin levels and age. Jaundiced neonates with prematurity, neonatal sepsis, meningitis or congenital anomalies were excluded.

Results

A total of 6454 full term neonates were admitted during the 4 years period. Of these 1944 had NNJ(30.1%). Majority of babies with NNJ were home deliveries and were referred to our unit on

development of jaundice that did not improve with the treatment by general practitioners. One hundred and sixty babies were G6PD deficient (8.2% of babies with NNJ and 2.4% of total admissions). All except 7 neonates were males. The commonest age at presentation and admission was 4-7 days. (47.5%) followed by 0-3 days (31.25%). Eighty-five (53.1%) G6PD deficient neonates developed severe hyperbilirubinemia (indirect bilirubin more than 20, mg%) and required exchange transfusion. Twenty-three (14.1%) infants with G6PD deficiency developed bilirubin encephalopathy (BE), seven (4.3%) of whom died.

Discussion

NNJ is the most common cause of admission (30.1% of total admission) to our neonatal unit. This may be due to high frequency of factors like ABO and Rh incompatibility and G6PD deficiency in our community. Other socio-cultuml and environmental factors may be delayed initiation of breast feeding, administration of pre-lacteal feeds (like Ghutti, Barthangetc)as traditional first feeds, over wrapping in heavy clothing for the fear of developing pneumonia leading to dehydration and denial of daylight. About 8.2% of babies admitted for NNJ were G6PD deficient indicating a high prevalence of G6PD deficiency in our tertiary care referral hospital. In another study from Peshawar[8], 31 out of 267 (11.6%) babies admitted for NNJ were G6PD deficient. An incidence of 6% is reported from Lahore[9]. The frequency of this enzyme deficiency varies from 1.5%-51%[10-12] in different parts of the globe. The severity of expression may also be different among different individuals in the same community[1,2]. These variations may be due to differences in genetic make-up of societies, frequency of carrier individuals, sample size and detection rate. G6PD deficiency is an X-linked disorder, mainly affecting males, however, it has been reported in females[1,2] also. G6PD deficiency was 21.6% in males and 11% in female infants of Saudi Arabia[13], while the figures were 5.6% and 2.2% in Canada[14]. The occurence in females is possibly due to being homozygous for G6PD deficiency, heterozygous with unusually severe penetrance or doubly heterozygous for two genes of G6PD deficiency. Also, there may be a variation in the inactivation of the normal X-chromosome or sthe screening assay may be detecting only some of the female heterozygous[15]. G6PD enzymopathy is associated with many complications. The incidence of severe hyperbiirubinemia is high in G6PD deficient babies[10]. Incidence of severe NNJ in Saudi neonates was 34% in G6PD deficient compared to 9% in non deficient neonates with no offending factors detected inbabies or their mothers[16]. Also, G6PD deficient neonates are more likely to develop hyperbilirubinemia (and some times kemicterus) than control group and may need photothempy and exchange transfusions often in the absence of any identifiable trigger[17]. It is estimated that 20% of G6PD deficient male neonates develop NNJ due to the enzyme deficiency, after excluding known causes of NNJ and after correcting for the incidence of NNJ from unknown causes[18]. Neonates with this enzyme deficiency are reported to be more susceptible to late neonatal sepsis and other infections[13,19-22]. G6PD deficiency is an important cause of acute severe hemolytic anemia, shock, renal failure and hemoglobinurea in the post neonatal period[23,24], and is associated with different forms of hemoglobinopathies: alpha and beta thalassaemia, structurally abnormal hemoglobin S and methemoglobinemia[13]. Thalassaernia and different types of infections are very common in our community, therefore, association between these factors and G6PD deficiency needs further studies in our society. Keeping in view, the high incidence of G6PD deficiency in our population, the obstetricians should be cautious in prescribing oxidant drugs (antimalarial, sulfonamide and antipy retics) specially during the third trimester of pregnancy, which can cross the placental barrier and lead to hemolysis in the G6PD deficient fetus. Proper health education regarding child bearing practices, breast feeding and discouragement of traditional first feed is also important. Private practitioners

should keep G6PD deficiency in mind when prescribing medicines and should refer all the infants with NNJ for proper investigations and treatment. In selected cases with a strong family history of severe NNJ or deaths from NNJ, parental screening for G6PD deficiency may be warranted.

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