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SHORT COMMUNICATION

Screening for G6PD Deficiency Among Neonates with Neonatal Jaundice Admitted to Tertiary Care Center: A Need in Disguise

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ABSTRACT

This study was conducted to determine the association of Glucose-6-Phosphate Dehydrogenase (G-6-PD) deficiency among neonates admitted with jaundice at the neonatal intensive care unit, well baby nursery and neonatal step down nursery of the Aga Khan University Hospital, Karachi, Pakistan, from January to June 2010. A total of 205 neonates following the selection criteria were included. All selected neonates have their venous blood drawn, saved in EDTA bottle and sent to laboratory of The Aga Khan University Hospital (AKUH). The laboratory results of whether G-6-PD deficiency was present or not was recorded in the proforma. G-6-PD was deficient in 19 neonates (9.3%). All neonates were male.

Key Words: *Jaundice. Neonatal. Glucose-6-phosphate dehydrogenase deficiency. Hyperbilirubinaemia. Indirect hyperbilirubinaemia.*

Glucose-6-Phosphatase Dehydrogenase (G-6-PD) deficiency inherited as an X-linked recessive disorder, is notorious due to potentially life-threatening hemolysis (favism) and severe bilirubin encephalopathy (kernicterus) in neonates. All babies with G-6-PD deficiency usually developed hyperbilirubinaemia within the first week of life. Phototherapy is required by almost all the neonates with an additional requirement of exchange transfusion in several.[1] If not appropriately treated, Kernicterus is likely to develop into life-long severe mental retardation. In Pakistan, most of the new-borns (65%) are delivered at home.[2] If they develop jaundice, parents usually do not seek medical advice immediately. The usual practice is to keep the baby at home and treat the jaundice by exposing the baby to early morning sun-shine or give glucose water or use spiritual methods etc. These practices not only increase the risk for severe jaundice but also its life-long consequences. Various population based studies have shown a prevalence ranging from 2 to 3.8%.[3] There are only few local studies available to determine the prevalence of G-6-PD deficiency in Pakistani neonates. This cross sectional study was carried out at neonatal intensive care unit, well baby and neonatal step down nursery of the Aga Khan University Hospital (AKU), from January to June 2010. All admitted neonates whether born in AKU or outside AKU, having jaundice with serum bilirubin of 15 mg/dl for term baby and 12 mg/dl for pre-term with predominant unconjugated hyperbilirubinaemia, of either gender were enrolled in the study following the written informed consent. Neonates with congenital anomalies or conjugated bilirubin more than 20% of the total bilirubin or those who had history of blood or exchange transfusion or received other therapy (e.g. phenobarbitone or metalloporphyrins etc.) were excluded from this study. Venous blood sample of 2 - 3 ml was drawn from selected neonates and was sent to the AKUH laboratory. Enzyme assay for G-6-PD was carried out on whole blood with EDTA as anticoagulant. The details of neonates and laboratory results were recorded in the proforma. The data was entered and analyzed in SPSS version 20 (SPSS Inc., Chicago, IL, USA). The categorical variables were presented as frequencies and percentages; and continuous variables were reported as mean ± standard deviation. Effect modifiers like age, weight, gestational age and serum indirect bilirubin were controlled through stratification to see the effect of the variables on outcome using chi-square test and p-value of ≤ 0.05 was considered significant.

The present samples of 205 preterm/term neonates with indirect hyperbilirubinaemia were included. The average total serum bilirubin (SBR) was 18.03 ± 13.4 mg/dL with direct average SBR was 0.54 ± 0.26 mg/dL and the average indirect SBR was 16.55 ± 2.91 mg/dL. The results found that the prevalence of glucose-6-Phosphate Dehydrogenase (G-6-PD) deficiency was 9.3% i.e. 19 neonates were deficient whereas 186 neonates i.e. 90.7% were not deficient. All of these neonates were male. Thirty six (17.6%) were preterm and 169 (82.4%) term infants. The mean age of neonates at the time of presentation was 4.52 ± 3.042 days (ranging from 2 to 17 days). The mean weight of enrolled neonates was 2.7 ± 0.375 kg (ranging from 2.0 to 3.6 kg). Stratified analysis of G-6-PG deficiency by different variables is shown in Table I.

A study with the same objective but with large sample size was conducted in Saudi Arabia, found the prevalence of G-6-PD deficiency of 2%.[4] Likewise in Iran, to determine the prevalence of G-6-PD deficiency

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Table I: Stratified analysis of G-6-PG deficiency by different variables.

Variables	Glucose-6-phosphate dehydrogenase deficiency		p-value
	Yes (n=19)	No (n=186)	
Age (days)			
0 - 6 days	18 (94.7%)	154 (82.7%)	0.321*
7 - 28 days	1 (5.2%)	32 (17.2%)	
Weight (kg)			
< 2.5 kg	9 (47.3%)	62 (33.3%)	0.310**
≥ 2.5 kg	10 (52.6%)	124 (66.6%)	
Gestational age			
Term	17 (89.4%)	152 (81.7%)	0.537*
Preterm	2 (10.5%)	34 (18.2%)	
Serum indirect bilirubin (mg/dl)			
< 17.5 mg/dl	7 (36.8%)	96 (51.6%)	0.220**
≥ 17.5 mg/dl	12 (63.1%)	90 (48.3%)	

**p-value calculated by Fisher's exact test; **p-value calculated by Chi-square test.*

out of a large sample (1307 males, 1194 females) screened, 79 neonates were found to have G-6-PD deficiency. The overall incidence of G-6-PD deficiency was 3.2%.[5] The present study although showed a prevalence around 9% which is very high as compared to above mentioned studies.

A study was conducted in Pakistan to detect the frequency of G-6-PD deficiency in 200 neonates admitted with jaundice to the neonatal unit, LRH, Peshawar. There were 145 (72.5%) were males while 55 (27.5%) were females. The results found that 16% (32) babies were found to be G-6-PD deficient.[6] These results showed a lower prevalence of G-6-PD deficiency in jaundiced neonates in Karachi. However, this small difference may be due to differences in sampling and sample size.

G-6-PD deficiency is a common cause of neonatal jaundice and has more propensity for male gender. Babies suffering from G-6-PD deficiency present with jaundice relatively earlier than the other causes of neonatal jaundice like ABO/Rh incompatibility and idiopathic causes. So early characterization of G-6-PD activity provides an etiological diagnosis for Neonatal Jaundice (NJ), as well as the opportunity for the early institution of the therapy like phototherapy etc. This will prevent the child from complications of neonatal jaundice but also long-term consequences i.e. mental retardation and cerebral palsy. Early detection of this enzymopathy would be a viable option through mass screening programs. Several factors needed to be considered in evaluating the feasibility, need and cost effectiveness of any neonatal mass screening programs, prevalence and severity of the disease in target population, availability of inexpensive and user friendly screening tests, access to treatment and follow-ups etc. the authors recommend a large study with more female neonates to validate these findings as well as other factors that can act as confounders. There is strong relationship between G-6-PD deficiency and severe neonatal jaundice. This provides a very strong rationale to collect epidemiological data so that treatment, prevention and management strategies could be developed, applied and implemented, keeping in view the local socio-demographic characteristics.

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