Limitation of glucose oxidase method of glucose estimation in jaundiced neonates

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The most widely used method for estimation of plasma glucose is that adopted by Trinder’s using glucose oxidase-peroxidase (GOD-POD) system. This method gives much lower blood glucose values with blood samples of neonatal jaundice (plasma bilirubin level > 10 mg/dL) of age 10±5 days than with samples of neonates of the same age group without jaundice or older children suffering from other diseases like acute respiratory distress, septicemia.

**Keywords**: Glucose oxidase-peroxidase method, Neonatal jaundice, Reduced glutathione.

The Trinder¹ method of plasma glucose estimation utilizes glucose oxidase-peroxidase (GOD-POD) system. This method is reported to give satisfactory results with blood samples from normal as well as many pathological condition of person of all age groups. Previous studies from our laboratory indicated possible changes in the antioxidant defense status of erythrocytes and significant increase in reduced glutathione (GSH) in the plasma of jaundiced neonates². In the present communication we report that the values of plasma glucose in jaundiced neonates (j.n.) estimated by the method of Trindes¹ were appreciably lower than those by Folin Wu³ and Nelson Somogyi’s method⁴.

Plasma samples of the present study were those of jaundiced neonates, both preterm and full term admitted to the nursery of Institute of Child Health, Kolkata. For comparison plasma samples of neonates without any history of intestinal complication and jaundice were taken as control group. Control group also included 20 older children of above 21 days who had just recovered from neonatal jaundice. The rest of the patients of the control group were patients of acute respiratory distress (n=15) and septicemia (n=5). Blood sample was obtained by vein-puncture and collected over NaF (10 mg/ml of blood) to minimize glycolysis; at this concentration NaF does not inhibit the enzyme activity of GOD-POD system. Another part of blood was allowed to clot in a separate vial for estimation of bilirubin by the method of Evelyn and Malloy⁵. Glucose was estimated in whole blood by Folin Wu method, in plasma by Trinder and Nelson Somogyi’s method.

The results presented in Table 1 indicate that in case of neonates (0-15 days) having serum total bilirubin (10±5 mg/dL) the concentration of glucose in the plasma by GOD-POD method gives much lower value than that given by Folin Wu and Somogyi’s method of glucose estimation. The blood glucose concentration of the non-jaundiced neonates and older children measured by the three different methods give no significant differences in values. In the case of children of higher age group (50±15 days) no significant difference in blood glucose values as determined by the three different methods was observed irrespective of their clinical status jaundiced or non-jaundiced.

This discrepancy in results obtained in jaundiced neonates can be explained as follows. In the neonates and older children under study the oxygen liberated by the GOD-POD system in the reaction medium is accepted by either amino antipyrine or O-dianisidine. The release during neonatal jaundice of a more potent oxygen acceptor than amino antipyrine and O-dianisidine due to change in the oxidative defense mechanism probably explains the lower blood glucose values obtained with the blood of neonates having hyperbilirubinemia. In the older group children, the red blood cells are probably less challenged with respect to oxidative damage by hyperbilirubinemia. From the present study it is evident that there is a limitation of the GOD-POD method of glucose estimation if applied to the blood samples of the neonatal jaundice patient of the age group (10±5 days).

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This limitation has to be kept in mind by those who estimate blood glucose in such samples.

References


<table>
<thead>
<tr>
<th>Condition</th>
<th>Number</th>
<th>Age (in days)</th>
<th>Serum Tb mg/dL</th>
<th>Blood glucose level (mg/dL) by</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GOD-POD</td>
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<tr>
<td>Jaundiced</td>
<td>40</td>
<td>10±5</td>
<td>10±5</td>
<td>20±5</td>
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<td>45</td>
<td>50±15</td>
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<td>Non-jaundice*</td>
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<td>1.5±0.5</td>
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<tr>
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<td>40</td>
<td>50±15</td>
<td>1.5±0.5</td>
<td>82±15</td>
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</tbody>
</table>

*The group of non-jaundiced condition is explained in the text.