Efficacy of Hematological Indices for β Thalassemia Trait Screening in Pregnant Women

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Abstract: Background: β thalassemia is one of the commonest inherited disorder in Pakistan having a carrier rate of 5%. Pregnant women having β thalassemia trait can have offspring having β thalassemia major which is lifelong blood transfusion dependent state. Different screening programmes are being carried out in various parts of the world so that the birth of children having β thalassemia major can be effectively reduced.

Objective: To determine the diagnostic accuracy of hematological parameters in identifying β thalassemia trait in pregnant women keeping measurement of HgbA2 as gold standard.

Methods: 108 pregnant women were enrolled during one year of the study period. Blood sample was taken and blood complete picture was obtained. By using variables of CP card Green & King index, Shine & Lal index and RDWI were calculated keeping hemoglobin electrophoresis as gold standard.

Results: The age of patients ranged from 17 to 37 years with mean age of 24.65. Out of 108 pregnant women enrolled in study 40 were found obtained. By using variables of CP card Green & King index, Shine & Lal index and RDWI were calculated keeping hemoglobin electrophoresis as gold standard.

Conclusion: Automated cell counters based formula including Green & King index, Shine & Lal index and RDWI provide rapid, reliable and cost effective method for screening of β thalassemia trait especially in third world countries like Pakistan. However none of them have 100% sensitivity and specificity. So they should be collectively looked at in screening programmes.

Keywords: β Thalassemia trait, Hemoglobin electrophoresis, Red cell indices, Microcytic anemia, Iron deficiency.
While pregnant women having ß thalassemia trait can be diagnosed of iron deficiency anemia can result in significant having a carrier rate of 5-6% in Pakistani population [4, 5]. It deficiency anemia is the commonest cause of anemia in normocytic normochromic. Among microcytic anemia, iron affecting nearly 51% of pregnant women worldwide. It has Anemia in pregnancy is a global health problem which is

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Some other simple and diagnosis of ß thalassemia trait [5]. Some other simple and while elevated HbA2 levels serve as gold standard for identifying β thalassemia trait was calculated, keeping the accuracy of nine indices in identifying ß thalassemia trait. The usefulness of seven indices including Mentzer index, Shine & Lal index and RDWI provide rapid, many previous studies with Shine & Lal index having greatest sensitivity and specificity of 95% and 0% respectively. While RDW index has sensitivity of 50% and specificity of 100%, however, hemoglobin electrophoresis is gold standard for diagnosing ß thalassemia trait [23-25]. The results of my study are comparable to many studies done in past. Okan et al. conducted a study to examine the accuracy of nine indices in identifying ß thalassemia trait. Indices examined in the study were RBC count, RDW, Mentzer index, Shine & Lal index, England & Fraser index, Srivastava index, Green & King index, RDW index and Ricerca. Similarly in an another study Niazi et al. studied the

RESULTS
Out of 108 pregnant females 40 were found to have β thalassemia trait on the basis of results of hemoglobin electrophoresis (Table 2). Diagnostic accuracy of Green & Kings index (Table 3), Shine & Lal index (Table 4) and RDWI (Table 5) in identifying β thalassemia trait was calculated, keeping the results of hemoglobin electrophoresis as gold standard.

<table>
<thead>
<tr>
<th>Index</th>
<th>Formula</th>
<th>BTT</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green &amp; King</td>
<td>MCVXMCVXRDW/(Hbx100)</td>
<td>&lt;65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shine &amp; Lal</td>
<td>MCVXMCVXMCH/100</td>
<td>&lt;1530</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RDWI</td>
<td>MCVXRDW/RBC</td>
<td>&lt;220</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Females Identified as Having BTT on Haemoglobin Electrophoresis.

<table>
<thead>
<tr>
<th>Total No Pregnant Females</th>
<th>Females Having β Thalassaemia Trait On Hgb Electrophoresis Result (HgbA2&gt;3.5%)</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>108</td>
<td>40</td>
<td>3.1279</td>
<td>1.21947</td>
</tr>
</tbody>
</table>

DISCUSSION
β thalassemia has a recessive mode of inheritance. It is one of most common inherited single gene disorder [9, 10]. Different β thalassemia carrier screening programmes are being conducted throughout the world, as this is the only effective way of reducing the incidence of thalassemia major births [11-14]. In Pakistan β thalassemia has a carrier rate of 5%. Good and effective screening programme is the need of hour in developing country like Pakistan [15-17]. Definitive diagnosis of β thalassemia is by hemoglobin electrophoresis [18-20]. However it is expensive and only available at restricted places [21, 22]. My study aims at the use of different hematological parameters which include Green & King index, Shine & Lal index and RDW index for identifying β thalassemia trait in pregnant women, so that effective genetic counseling can be provided to parents of affected offspring. My study included 108 pregnant women having β thalassemia trait diagnosed by hemoglobin electrophoresis. Green & King index, Shine & Lal index & RDW index were calculated by using simple hematological parameters like Hgb, RBC count, MCV, MCH and RDW. According to this study Green & King index has sensitivity of 32% and specificity of 100%. Shine & Lal index has sensitivity and specificity of 95% and 0% respectively. While RDW index has sensitivity of 50% and specificity of 100%, however, hemoglobin electrophoresis is gold standard for diagnosing β thalassemia trait [23-25]. The results of my study are comparable to many studies done in past. Okan et al. conducted a study to examine the accuracy of nine indices in identifying β thalassemia trait. Indices examined in the study were RBC count, RDW, Mentzer index, Shine & Lal index, England & Fraser index, Srivastava index, Green & King index, RDW index and Ricerca. Similarly in an another study Niazi et al. studied the
usefulness of seven indices including Mentzer index, Shine & Lal index, Srivastava index, England & Fraser, Ricerca, Green & King index, RDW index in differentiating microcytic hypochromic anemia. The percentage of correctly identified patients having β thalassemia trait was highest for RDW index (88.14%), followed by Mentzer index (86.85), Green & King (83.97%), Srivastava (82.37%), Ricerca (80.44%), England & Fraser (78.28%) and Shine & Lal (72.43%) [26]. We have done an effort to do screening of pregnant women having β thalassemia trait by the use of some simple hematological parameters. Our results are similar to many previous studies with Shine & Lal index having greatest sensitivity [27, 28]. Yeo GS et al. conducted a study showing similar results [29]. So if pregnant women are screened by using these simple parameters we can effectively reduce the number of infants having β thalassemia major which is a lifelong transfusion dependent state.

**CONCLUSION**

Automated cell counters based formula including Green & King index, Shine & Lal index and RDWI provide rapid, reliable and cost effective method for screening of β thalassemia traits especially in under resourced countries like Pakistan. However none of them have 100% sensitivity and specificity so it is better to look at them collectively, while hemoglobin electrophoresis remains the Gold standard for identification of β thalassemia trait.

**CONFLICT OF INTEREST**

Declared None.

**ACKNOWLEDGEMENTS**

Declared None.

**REFERENCES**


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