COMPARISON OF PLATELET COUNTS BY SYSMEX XE 2100 AND LH 750 WITH THE INTERNATIONAL FLOW REFERENCE METHOD IN THROMBOCYTOPENIC PATIENTS

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• Precise platelet count is critical to a decision for transfusion.

• Practice guidelines based on clinical outcome analysis suggest that the threshold for prophylactic platelet transfusion can be lowered from $20 \times 10^9/l$ to $10 \times 10^9/l$ or less for most clinical situations. However for this to be used resourcefully, a high degree of precision is required in platelet count below $20 \times 10^9/l$.

• International flow cytometry reference method (IRM) also known as the red blood cell (RBC) platelet ratio method is the current gold standard method provided by the international council for standardization in hematology (ICSH).

• It is, however, time and labor intensive vis-à-vis platelet count by automated hematology analyzers and hence not suitable for routine platelet counting. Robust hematology analyzers, which can be used for platelet enumeration, promise to fill this void.

The aim of this study was to assess the accuracy and precision of different platelet counting technologies (impedance and optical florescence) by using different automated hematology analyzers (Sysmex XE2100 & LH750), against the IRM in thrombocytopenic blood samples.
MATERIALS AND METHODS

A total of 118 blood samples with platelet count of <50 x 10⁹/l were selected for the study. Of the 118 blood samples selected, 45 were from oncology, 54 belonged to the infectious category and rest 19 were put in the miscellaneous category (ex ITP).

Platelet counts were thus evaluated in parallel by five methods:

1. XE 2100-optical (Sysmex-O)
2. XE 2100-impedance(Sysmex-I)
3. XE 2100-reported (Sysmex-R) based on switching algorithm
4. LH-750 impedance with curve fit correction on Beckman Coulter (LH-750)
5. IRM done on the Becton Dickinson FACS Canto II (IRM).

- Blood samples showing flags on either of the complete blood count analyzers (XE 2100 or LH-750) indicating the potential presence of platelet clumps or findings that potentially may interfere with automatic analysis were not included in this study.
- All blood specimens were collected in dipotassium ethylenediaminetetraacetic acid (K₂EDTA) vacutainers.
- All samples were tested in parallel by different methods within 6 hours of blood collection.
1. **PEARSON CORRELATION:**
Platelet counts by all methods showed a very good correlation of >0.9 with IRM.

2. **BLAND ALTMAN ANALYSIS**
The Bias and Limits of Agreement (LA) for different methodologies vs IRM were:

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Bias</th>
<th>Limits of Agreement (LA)</th>
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<tbody>
<tr>
<td>Sysmex-I</td>
<td>-2.805</td>
<td>-15.857 to +10.246</td>
</tr>
<tr>
<td>LH-750</td>
<td>-2.636</td>
<td>-12.966 to +7.695</td>
</tr>
<tr>
<td>Sysmex-O</td>
<td>+1.297</td>
<td>-9.128 to +11.720</td>
</tr>
<tr>
<td>Sysmex-R</td>
<td>+0.780 (lowest bias)</td>
<td>-9.067 to +10.627</td>
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3. **PPV (Positive Predictive value) & NPV (Negative Predictive value) for over transfusion & under transfusion**

<table>
<thead>
<tr>
<th>Transfusion threshold ≤10,000/µl</th>
<th>Transfusion threshold ≤20,000/µl</th>
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</thead>
<tbody>
<tr>
<td>PPV</td>
<td>Sysmex-R</td>
</tr>
<tr>
<td>90%</td>
<td>93.7%</td>
</tr>
<tr>
<td>79%</td>
<td>79%</td>
</tr>
<tr>
<td>95%</td>
<td>96.6%</td>
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* (100% - PPV) = Risk of Over transfusion  
(100% - NPV) = Risk of Under transfusion
We conclude that the platelet counts determined by Sysmex-R (which takes into account both optical and impedance) and LH-750 (which uses impedance with platelet fitting curve) showed good correlation with the platelet counts as determined by the IRM.

In oncology patients, LH-750 proved to be better, suggesting that optical method may not be always required for platelet counting in oncology patients. However, optical method may be required in other categories, like infections and ITP where the size of the platelet may be large.

The risk of over transfusion was maximum (21%) with Sysmex – I at both the 10,000/μl and 20,000/μl thresholds, followed by LH750 at 15% and 21%, Sysmex R at 10% and 7% at the two thresholds whereas for Sysmex O method the risk of over transfusion was the least at 5% and 7% respectively.

The risk of under transfusion at the threshold of 10,000/μl and 20,000/μl was least with LH-750 i.e. 3.4% and 1.4% respectively. However none of the instruments had an undertransfusion risk of >10%.