CLINICAL UTILITY OF A WHITE BLOOD CELL AND DIFFERENTIAL COUNT POINT-OF-CARE TEST AND AGREEMENT WITH ROUTINE LABORATORY

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SUMMARY

White blood cell (WBC) and differential leukocyte counts are well-known markers of infection. This study was aimed at assessing the clinical utility and agreement of the results obtained with a point-of-care test known as WBC-DIFF compared to those obtained by a centralised laboratory. Agreement analyses were performed comparing the two results. Forty-four subjects were recruited, with a mean age of 52.6 ± 15.3 years. The mean number of WBCs measured with the WBC-DIFF was 6,968.2 ± 1,910 cells/µL compared to 7,153.8 ± 2,005 cells/µL reported by the reference laboratory. Good agreement was observed, with no significant differences between the two measurements as the number of cases deviating more than 15% of difference between the two distributions was 22.7%. However, this deviation was 36.4% for neutrophils, 43.2% for eosinophils, 52.3% for lymphocytes, 68.2% for basophils and 100% for monocytes.

INTRODUCTION

White blood cell and differential leukocyte counts are well-known markers often used to differentiate between bacterial and viral infections.¹² The WBC-DIFF (HemoCue AB, Ängelholm, Sweden) is a point-of-care testing (POCT) instrument for white blood cell and differential counts. The main advantage of this test is its shorter turnaround time to obtain results compared with the classical determination in a central laboratory, with the results being available within five minutes after a
fingerpick procedure. This fact is crucial in primary care as these tests can be carried out in seven-to-ten-minute consultations. This study was undertaken to assess the clinical utility and agreement of the WBC-DIFF POCT results compared to those obtained by a centralised laboratory.

MATERIAL AND METHODS

Capillary samples were taken from healthy subjects aged 14 or more in two consultations at an urban healthcare centre. Individuals undergoing routine blood analyses on Friday from April to June 2015 were recruited to participate in the study. After signing the informed consent, the participants’ temperature was measured, and venous blood was drawn by nurses and sent to the central laboratory and then the WBC-DIFF POCT was performed. Agreement analyses were performed comparing the results obtained with the POCT with those of the central laboratory analysed by the Automated Hematology Analyzer XN series XN-20. The Student’s t tests were performed to determine the difference between the two measurements, and a Bland-Altman plot of the difference between the means of the two methods was made. We also calculated the percentage of the test results deviating more than 15% between the determinations of the two methods recommended as a quality control measurement in the last Clinical Laboratory Improvement Amendments issued in 1988 (CLIA-88).

RESULTS

A total of 45 subjects were recruited; however, one was discarded as WBC-DIFF did not provide a valid result. The mean age of the 44 individuals was 52.6 ± 15.3 years, 30 of whom were women (68.2%). The mean temperature was 35.7 ± 0.6°C. The mean number of white blood cells measured with the WBC-DIFF POCT was 6.97±1.9 cells/mm³ compared to 7.15±2.01 reported by the reference laboratory. Good agreement was observed, with no significant differences between the two measurements, indicating that the two distributions were related (Figure 1). The mean neutrophil counts were 3.63±1.34 and 4.04±1.60, respectively, whereas the mean lymphocyte counts were 2.72±0.96 and 2.33±0.86 (Table 1). No agreement was observed among the differences in the leukocyte counts between the two determinations. The number of cases not fulfilling the CLIA-88 recommendations (more than 15% of difference between the two distributions) was 22% for the white blood cell count, 36.6% for neutrophils, 43.9% for eosinophils, 51.2% for lymphocytes, 68.3% for basophils and 100% for monocytes.

DISCUSSION

These results show that the WBC-DIFF POCT is a good instrument for the quantitative determination of whole white blood cell count in the general population. The instructions are easy to follow, and the instrument can be used by professionals with no previous experience in laboratory technology. However, with regard to the differential counts, the agreement was weaker, and less than half of the neutrophil and eosinophil results were not in accordance with CLIA-88. The small differences observed between these counts and the reference measurement may not be clinically meaningful, but the differences observed in the other counts (lymphocytes, monocytes and basophils), which were similar to what has been described in previous studies, might be clinically misleading. In our study the count of neutrophils was higher with the POCT whereas the lymphocyte count was lower with the rapid test compared to those provided by the central laboratory, similarly to what Karawajczyk et al showed in a recent study with paediatric population.

In conclusion, WBC-DIFF appears to be a good instrument regarding the quantitative count of leucocyte, but its utility in terms of the differential count is not optimal. The utility of this POCT should now be analysed in patients with infectious diseases.
Table 1. Results obtained with the WBC-DIFF rapid test and those obtained by a centralised laboratory.

<table>
<thead>
<tr>
<th>White blood cells</th>
<th>WBC-DIFF (mean of cells/µL, SD)</th>
<th>Central laboratory (mean of cells/µL, SD)</th>
<th>Difference between the two determinations (mean of cells/µL, SD)</th>
<th>Differences greater than 15% between the two determinations (n, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall WBC count</td>
<td>7,153.8 (2,005.2)</td>
<td>6,968.2 (1,910.0)</td>
<td>-186.1 (95.6)</td>
<td>10 (22.7)</td>
</tr>
<tr>
<td>Neutrophils</td>
<td>4,040.5 (1,600.2)</td>
<td>3,634.1 (1,335.2)</td>
<td>-376.1 (59.1)</td>
<td>16 (36.4)</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>2,328.8 (858.2)</td>
<td>2,720.5 (958.1)</td>
<td>360.0 (51.2)</td>
<td>23 (52.3)</td>
</tr>
<tr>
<td>Monocytes</td>
<td>546.4 (155.6)</td>
<td>450.0 (140.6)</td>
<td>-96.0 (16.8)</td>
<td>44 (100)</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>190.2 (139.1)</td>
<td>145.5 (84.8)</td>
<td>-41.0 (8.4)</td>
<td>19 (43.2)</td>
</tr>
<tr>
<td>Basophils</td>
<td>48.3 (21.5)</td>
<td>0 (-)</td>
<td>-49.0 (2.1)</td>
<td>30 (68.2)</td>
</tr>
</tbody>
</table>

Funding

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Conflicts of interest

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REFERENCES
