Platelet Indices show marked systematic bias on storage under ideal conditions: An important preanalytical factor affecting the interpretation of platelet indices

Sir,

Systematic bias occurring on storage is an important preanalytical error with implications for clinical decision-making. The mean platelet volume (MPV), plateletcrit (PCT), and platelet distribution width (PDW) have been proposed as discriminatory indices in a variety of clinical settings.[1] In the blood bank, platelet indices are important to check disease progression in dengue patients and are also important measurands in studies on platelet concentrates. However, the reported values of the parameters may change on sample storage, resulting in interpretational difficulties. This study was conducted to investigate the short-term stability of the platelet indices (MPV, PDW, and PCT) when stored under ideal clinical laboratory conditions (4°C and 22°C).

The design for this study followed the plan we have already published.[2] In this study, blood in four K2EDTA anticoagulated vials (Becton Dickinson and Company, Gurgaon, India) was collected during blood donation from the diversion pouch of the blood bag from twenty eligible blood donors, after consent for blood donation. Readings from each of the four vials were taken on the Sysmex XP-100 hematology analyzer (Sysmex Corporation, Kobe, Japan) within 15 min of collection. The mean of these readings from the four vials was accepted as the baseline value for each parameter. The samples were stored after the baseline analysis. Of the four vials initially taken, only two were used further for the purpose of this particular study. One vial was kept in a refrigerator at 4°C and the other vial stored at 22°C, while the remaining two vials were stored at 33°C and 37°C and formed the part of another study.[3] Platelet indices were measured from the study vials (stored at 4°C and 22°C) at three time points: after 1 h, 3 h, and 6 h of storage. The mean of two readings for each of the reported platelet indices was used as a representative value at that particular temperature.

The representative value for each of the parameters at each temperature time point was compared to the baseline values. The percentage change from the baseline for each parameter was calculated at each time point and reported as a median with 95% confidence interval. This percentage change was then compared against the maximum acceptable bias according to the biological variation database.[4] A median percentage change exceeding the maximum acceptable bias was considered as an unacceptable change for that parameter. Such unacceptable change was confirmed by the Wilcoxon signed-rank test, with adjustment for multiple comparisons by the Holm–Bonferroni procedure.[5] The equipment used was validated on installation. The coefficients of variation (CV) of the primary parameters were within satisfactory limits. The CVs of MPV, PDW, and PCT were estimated to be 1.7%, 4.7%, and 3.9%, respectively.[6]

The samples taken from one donor did not give any readings for the platelet indices; the results from the rest nineteen donors were analyzed. The description of the measured parameters is given in Table 1. The median percentage changes with the test of statistical significance in all the studied parameters are given in Table 2. All the measurements of MPV showed evidence of a significant shift on storage within 1 h at both 4°C and 22°C. PDW showed appreciable change within 3 h on storage at 4°C and 1 h at 22°C. PCT was the most stable parameter of the three, but still showed appreciable change within 3 h at 22°C but not at 4°C.

Table 1: Median values of platelet indices at different time points of storage for samples stored at 4°C and 22°C (*n*=19)

Platelet indices parameters	Baseline value	Storage at 4°C temperature			Storage at 22°C temperature		
		1 h	3 h	6 h	1 h	3 h	6 h
PDW (fL)	13.4 (9.9-20.1)	13.6 (10.7-21.2)	13.9 (10.9-22.1)	13.9 (11.1-21.1)	13.9 (10.6-19)	14.5 (11.1-20.6)	14.4 (11.7-20)
MPV (fL)	10.4 (8.5-13.1)	10.6 (8.8-13.5)	10.8 (9-13.5)	11.0 (9.3-13.8)	10.8 (8.7-13.5)	11.2 (9.2-13.7)	11.3 (9.3-13.6)
PCT	0.24 (0.19-0.42)	0.24 (0.17-0.45)	0.24 (0.14-0.44)	0.24 (0.18-0.44)	0.26 (0.13-0.44)	0.26 (0.17-0.46)	0.26 (0.18-0.46)

PDW – Platelet Distribution Width; MPV – Mean platelet volume; PCT – Plateletcrit

Table 2: Median percentage change in platelet indices from baseline, with the range and the *P* values of the Wilcoxon signed-rank test (after Holm correction for multiple comparisons)

Platelet indices parameters	Storage at 4° C temperature			Storage at 22° C temperature		
	1 h	3 h	6 h	1 h	3 h	6 h
PDW						
Median (CI)	3.8 (1.87-7.98)	**6.67 (5.06-9.88)**	**13.5 (7.06-16.20)**	**7.49 (2.54-10.33)**	**11.46 (8.01-16.76)**	**12.36 (8.79-17.65)**
Range	−1.75-13.15	−1.75-14.74	2.68-21.97	−5.53-23.24	−1.55-25.59	−0.56-21.13
P	0.003	<0.001	<0.001	<0.001	<0.001	<0.001
MPV						
Median (CI)	**2.66 (1.44-3.62)**	**4.99 (3.45-5.93)**	**7.37 (5.63-9.50)**	**4.47 (2.97-5.67)**	**7.63 (7.2-8.39)**	**8.83 (7.44-10.26)**
Range	−0.24-6.42	−0.77-8.21	3.6-12.73	0.06-10.06	4.98-11.45	3.83-12.21
P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCT						
Median (CI)	1.82 (0.00-5.26)	2.70 (−1.27-5.26)	3.70 (−1.27-7.69)	4.00 (1.20-8.18)	**7.89 (5.26-9.44)**	**8.66 (5.26-10.81)**
Range	−32-8.11	−44-8.11	−14-13.16	−31.58-13.51	−13.16-13.51	−5.41-13.25
P	0.1	0.3	0.3	0.018	0.005	0.003

Maximum acceptable bias as per biological variation database used as reference value: PDW=5.36%, MPV=2.29% and PCT=5.84%. Unacceptable percentage changes are highlighted in Bold font. PDW – Platelet Distribution Width; MPV – Mean platelet volume; PCT – Plateletcrit; CI – Confidence interval

The platelet indices exhibit marked instability on storage under ideal conditions when collected in K2EDTA vials. It is recommended that research and diagnosis based on these indices be made cautiously; otherwise, potentially useful diagnostic or prognostic information may be obscured by this marked variability on storage.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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Submitted: 05-05-2019
Revised: 10-05-2020
Accepted: 30-08-2020
Published: 19-12-2020

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Access this article online	
Website: www.ajts.org	**Quick Response Code:**
DOI: 10.4103/ajts.AJTS_51_19	

How to cite this article: Jain A, Anthony ML, Gupta AK, Jain S, Meinia SK, Chowdhury N. Platelet Indices show marked systematic bias on storage under ideal conditions: An important preanalytical factor affecting the interpretation of platelet indices. Asian J Transfus Sci 2020;14:208-9.