Platelet indices: laboratory and clinical applications

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Dear Sir,

Platelet parameters, which include the plateletcrit (PCT), platelet distribution width (PDW) and mean platelet volume (MPV), have been available in the laboratory routine using blood cell counters for several years. Although many studies have attempted to establish clinical correlations to support their application, these parameters are still not used much owing to methodological problems which make standardization and the determination of reference values difficult. In addition, the question of their application to diagnosis has still not been fully clarified.[1,2]

A wide range of variables interfere in the value of platelet indices.[2,3] In the light of this, some studies suggest that each laboratory should establish its own reference values.[3]

Thus, the purpose of this study was to determine mean values for platelet indices (MPV, PDW, PCT) for gender and for age group and in respect to the number of platelets. A further aim was to evaluate any possible effect of hypertension and diabetes mellitus, as well as how platelet aggregation inhibitors, anticoagulants, and antihypertensive and hypoglycemic medications affect the values of these platelet parameters.

This study comprised 306 individuals (101 male and 205 female). Blood samples were collected by venipuncture in tubes containing EDTA anticoagulant (ethylene diamine tetraacetic acid) and processed within two hours. The platelet indices were analyzed in whole blood using a blood cell counter (Abbott Cell Dyn 3500 CS). The factorial ANOVA model with Tukey's test was used for statistical analysis and an alpha error of 5% (p-value < 0.05) was considered acceptable.

The mean values for MPV were 9.66 ± 0.46 fL for men and 9.89 ± 1.40 for women (Table 1) which are similar to the mean values quoted in the literature.[4]

In relation to gender, significant differences were observed only for the PCT levels. In regards to age, there were significant differences in the values for the three platelet indices comparing the under 10-year-old age group to the other age groups except for the 10 to 20-year-old age group. This result differs from other studies that do not describe variations related to the age of the individual.[2]

Moreover, there is an inverse relation between the platelet count and the MPV value (Table 2) which corroborates the results described in other studies.[2,3,5] The literature adopts the following reference values for MPV: MPV between 9 and 12 fL for platelet counts 150×10^9/L and MPV between 7.5 and 10 fL for platelet counts 400×10^9/L.[6] The mean value of MPV found in this study was 9.81 ± 1.42 fL. On considering different platelet counts the MPV was as follows: for $< 150 \times 10^9$ platelets/L the MPV was 10.78 ± 1.12; for between 150 and 400×10^9 platelets/L the MPV was 9.83 ± 1.42; for $> 400 \times 10^9$ platelets/L the MPV was 8.67 ± 1.08.

Table 1 - Platelet parameters with regard to gender and age

		MPV (fL)		PDW (fL)		PCT (%)		n
		Mean	SD	Mean	SD	Mean	SD	
Gender	Male	9.66	1.46	17.42	0.94	0.24	0.07	101
	Female	9.89	1.40	17.30	0.85	0.28	0.06	205
Age group (years)	< 10	8.59	0.89	0.30	0.09	16.60	0.58	33
	≥ 10 to < 20*	9.53	1.26	0.27	0.06	17.17	0.61	21
	≥ 20 to < 30	9.93	1.08	0.26	0.05	17.32	0.71	43
	≥ 30 to < 40	10.28	1.48	0.26	0.05	17.43	1.02	56
	≥ 40 to < 50	9.82	1.15	0.25	0.05	17.40	0.91	38
	≥ 50 to < 60	10.12	1.67	0.29	0.06	17.59	0.83	40
	≥ 60	9.84	1.48	0.24	0.06	17.49	0.89	75

MPV - mean platelet volume; PCT - plateletcrit; PDW - platelet distribution width; SD - standard deviation; p-value - level of significance for a null hypothesis; n - sample size; * statistically significant difference compared to the < 10 year old group

Table 2 - Platelet parameters regarding the use of medications and the presence of hypertension or diabetes mellitus and in relation to the levels of the platelet counts

		MPV (fL)			PDW (fL)			PCT (%)		
		Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value
Antiplatelet	A	9.82	1.45	0.886	0.26	0.06	0.314	17.33	0.88	0.494
	P	9.78	1.08		0.25	0.07		17.45	0.87	
Anticoagulant	A	9.81	1.42	0.617	0.26	0.06	0.703	17.34	0.88	0.588
	P	10.32	1.11		0.28	0.11		17.00	0.14	
Antihypertensive	A	9.79	1.43	0.597	0.27	0.06	0.128	17.29	0.90	0.168
	P	9.88	1.41		0.25	0.07		17.45	0.84	
Hyperglicemic	A	9.80	1.42	0.489	0.26	0.06	0.672	17.33	0.87	0.501
	P	10.01	1.38		0.26	0.07		17.45	1.00	
Hypertension	A	9.77	1.42	0.472	0.27	0.06	0.222	17.29	0.89	0.145
	P	9.90	1.43		0.26	0.07		17.45	0.87	
Diabetes mellitus	A	9.80	1.43	0.481	0.26	0.06	0.552	17.33	0.87	0.413
	P	10.01	1.35		0.26	0.06		17.48	0.98	
Platelets ($x10^9$/L)										
< 150		10.78	1.12		0.19	0.05		17.48	0.94	
150 to 400		9.83	1.42	0.016*	0.26	0.06	0.000*	17.35	0.89	0.195
> 400		8.67	1.08		0.42	0.06		16.82	0.55	

MPV - Mean platelet volume; PCT - Plateletcrit; PDW - Platelet distribution width; SD - standard deviation; p-value - significance level for the null hypothesis; A - absence and P - presence (of medicine and/or pathology); * - Significant statistical difference (p-value < 0.05)

When the effects of medications are assessed, there are reports that both anticoagulants and platelet aggregation inhibitors directly or indirectly influence the platelet indices. However, the data obtained in this study did not demonstrate any significant variations with the use of these medications.

Similarly, no significant variations were observed between individuals taking hypertensive medications and those who were not.

Additionally, platelet indices of diabetic patients were not significantly different to non-diabetic individuals. Other researchers have reported statistically significant differences between diabetic patients and healthy individuals.[7]

This study established mean values for the laboratory where the analysis was carried out which may help other laboratories when using these indices.

Moreover, an inverse relation was identified between the MPV and platelet count.

In conclusion, no significant variations were seen in the platelet indices that would suggest the existence of effects related to hypertension or diabetes mellitus or any consequences arising from the use of aggregation inhibitors, anticoagulants, antihypertensive agents or hypoglycemic medications.

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