

ABSTRACT

Background: Non-standard homogenization of capillary blood in EDTA microtainers, such as the shaking technique, risks triggering mechanical trauma to erythrocytes and affecting examination accuracy.

Objective: To analyze the difference in erythrocyte counts in capillary blood samples homogenized using inversion and shaking techniques.

Methods: This experimental study used a split-sample design. Sixteen capillary blood samples were divided into two treatments: inversion (control) and shaking (treatment), performed 8-10 times each. Erythrocyte counts were measured using the Beckman Coulter 500 Hematology Analyzer. Data were analyzed using the Wilcoxon Signed Ranks Test and clinical bias analysis compared to the 6% CLIA Total Allowable Error (TEa) threshold.

Results: The mean erythrocyte count for the inversion group was $4.816 \times 10^6/\mu\text{L}$, whereas the shaking group decreased significantly to $4.279 \times 10^6/\mu\text{L}$. Statistical analysis showed a significant difference ($p=0.001$). Clinical analysis revealed an 11.13% bias, exceeding the TEa limit.

Conclusion: The shaking technique causes a statistically and clinically significant decrease in erythrocyte counts due to mechanical lysis (false low). Laboratory personnel must implement the standard inversion technique to ensure diagnostic accuracy.

Keywords: Erythrocyte, Inversion, Shaking, Capillary Blood, Beckman Coulter 500.

ABSTRAK

Latar Belakang: Homogenisasi spesimen darah kapiler dalam tabung mikro EDTA yang tidak sesuai standar, seperti teknik *shaking* (pengocokan kasar), berisiko memicu trauma mekanis pada eritrosit dan memengaruhi akurasi hasil pemeriksaan.

Tujuan: Menganalisis perbedaan jumlah eritrosit pada sampel darah kapiler yang dihomogenisasi dengan teknik inversi dan *shaking*.

Metode: Penelitian eksperimen ini menggunakan desain *split-sample*. Sebanyak 16 sampel darah kapiler dibagi menjadi dua perlakuan: homogenisasi inversi (kontrol) dan *shaking* (perlakuan), masing-masing dilakukan 8-10 kali. Jumlah eritrosit diukur menggunakan *Hematology Analyzer* Beckman Coulter 500. Analisis statistik menggunakan uji *Wilcoxon Signed Ranks* dan persentase bias klinis dibandingkan dengan ambang batas *Total Allowable Error* (TEa) CLIA sebesar 6%.

Hasil: Rata-rata jumlah eritrosit pada kelompok inversi adalah $4,816 \times 10^6/\mu\text{L}$, sedangkan kelompok *shaking* menurun tajam menjadi $4,279 \times 10^6/\mu\text{L}$. Hasil uji statistik menunjukkan perbedaan yang signifikan ($p=0,001$). Analisis makna klinis menunjukkan persentase bias sebesar 11,13% yang melampaui batas TEa.

Kesimpulan: Teknik *shaking* menyebabkan penurunan jumlah eritrosit secara signifikan dan bermakna klinis akibat lisis mekanis (*false low*). Tenaga laboratorium wajib menerapkan teknik inversi sesuai standar guna menjamin akurasi diagnostik.

Kata kunci: Eritrosit, Inversi, *Shaking*, Darah Kapiler, Beckman Coulter 500