

INTISARI

Latar Belakang: Furosemid merupakan diuretik loop yang bekerja menghambat reabsorpsi $\text{Na}^+-\text{K}^+-2\text{Cl}^-$ dan menjadi terapi utama pada pasien gagal jantung akut. Furosemid dapat diberikan melalui rute *continuous infusion* (CI) maupun *bolus injection* (BI), namun bukti mengenai pengaruh kedua rute terhadap *urine output* dan kadar elektrolit masih menunjukkan hasil yang kontroversial.

Tujuan: Menganalisis perbedaan pengaruh penggunaan furosemid CI dan BI terhadap *urine output* serta perubahan kadar serum natrium dan kalium pada pasien gagal jantung akut.

Metode: Penelitian kohort retrospektif dilakukan pada 68 pasien gagal jantung akut di Rumah Sakit Akademik Universitas Gadjah Mada. Subjek dibagi menjadi kelompok CI (n=26) dan BI (n=42), yang seluruhnya telah menerima furosemid bolus sebagai terapi awal sebelum terapi *maintenance*. *Outcome* yang dianalisis meliputi *urine output* 24 jam, perubahan kadar natrium (ΔNa), dan perubahan kadar kalium (ΔK). Analisis statistik dilakukan menggunakan *paired samples t-test* atau *Wilcoxon signed-rank test* untuk perbandingan dalam kelompok, serta *independent t-test* atau *Mann-Whitney U test* untuk perbandingan antarkelompok.

Hasil: Tidak terdapat perbedaan yang bermakna pada *urine output* 24 jam antara kelompok CI dan BI dengan median masing-masing 998,5 mL (IQR 750,250–2886,750) dan 1141 mL (IQR 545,750–2298) ($p=0,738$). Kelompok BI menunjukkan perubahan kadar natrium yang lebih besar dibandingkan kelompok CI dengan median ΔNa masing-masing 2 mEq/L (IQR -0,250–5,250) dan 0 mEq/L (IQR -3–2) ($p=0,035$). Sebaliknya, perubahan kadar kalium tidak berbeda secara bermakna antara kedua kelompok (ΔK $-0,240\pm0,438$ vs $-0,546\pm0,740$; $p=0,064$).

Kesimpulan: Pemberian furosemid melalui *bolus injection* menghasilkan perubahan kadar natrium yang lebih besar dibandingkan *continuous infusion*. Namun, kedua rute pemberian menunjukkan pengaruh yang relatif sebanding terhadap *urine output* dan perubahan kadar kalium pada pasien gagal jantung akut.

Kata Kunci: *diuretic, furosemid, heart failure, continuous infusion, bolus injection*

ABSTRACT

Background: Furosemide is a loop diuretic that inhibits $\text{Na}^+\text{--K}^+\text{--}2\text{Cl}^-$ reabsorption and remains a cornerstone therapy for patients with acute heart failure. It can be administered via continuous infusion (CI) or bolus injection (BI); however, evidence regarding the effects of these administration routes on urine output and electrolyte levels remains controversial.

Objective: To compare the effects of furosemide administered by CI and BI on urine output and changes in serum sodium and potassium levels in patients with acute heart failure.

Methods: A retrospective cohort study was conducted among 68 patients with acute heart failure at Universitas Gadjah Mada Academic Hospital. Patients were classified into a CI group (n=26) and a BI group (n=42). All patients had received an initial intravenous furosemide bolus before maintenance therapy. The outcomes assessed included 24-hour urine output, changes in serum sodium (ΔNa), and changes in serum potassium (ΔK). Statistical analyses were performed using paired-samples t-tests or Wilcoxon signed-rank tests for within-group comparisons and independent t-tests or Mann–Whitney U tests for between-group comparisons.

Results: No significant difference was observed in 24-hour urine output between the CI and BI groups, with median values of 998.5 mL (IQR 750.250–2886.750) and 1141 mL (IQR 545.750–2298), respectively ($p=0.738$). The BI group demonstrated a significantly greater change in serum sodium levels than the CI group, with median ΔNa values of 2 mEq/L (IQR -0.250 to 5.250) and 0 mEq/L (IQR -3 to 2), respectively ($p=0.035$). In contrast, changes in serum potassium levels did not differ significantly between groups ($\Delta\text{K} -0.240\pm0.438$ vs -0.546 ± 0.740 ; $p=0.064$).

Conclusion: Bolus injection of furosemide was associated with greater changes in serum sodium levels compared with continuous infusion. However, both administration routes showed comparable effects on urine output and serum potassium changes in patients with acute heart failure.

Keyword: *diuretic, furosemide, heart failure, continuous infusion, bolus injection*