

INTISARI

Faktor Risiko *Positive End Expiratory Pressure* (PEEP) dan Volume Tidal terhadap Kejadian Gangguan Ginjal Akut (GnGA) pada Pasien yang dirawat di *Pediatric Intensive Care Unit* (PICU)

Latar Belakang: Angka kejadian gangguan ginjal akut (GnGA) meningkat pada anak sakit kritis. Penggunaan *positive end expiratory pressure* (PEEP) dan volume tidal (Vt) pada ventilator mekanik (VM) merupakan faktor risiko kejadian GnGA.

Tujuan: Untuk mengetahui apakah PEEP dan Vt merupakan faktor risiko GnGA pada pasien yang di rawat di *Pediatric Intensive Care Unit* (PICU).

Metode: Studi kohort prospektif dilakukan pada pasien anak usia 1 bulan sampai < 18 tahun di PICU Rumah Sakit Sardjito Yogyakarta, Indonesia, Mei hingga Oktober 2025. Subjek yang menggunakan ventilator dengan perkiraan hari rawat ≥ 48 jam diikutsertakan dalam penelitian ini. Data karakteristik dasar subjek (usia, jenis kelamin, status gizi, indikasi rawat PICU, alasan penggunaan ventilator, *balance* cairan, *diuresis*, penggunaan obat vasoaktif dan furosemid) dan besaran rata-rata PEEP dan Vt yang digunakan dalam 24 jam pertama dan 24 jam kedua dikumpulkan. Pemeriksaan kreatinin dan NGAL serum dilakukan pada awal penggunaan ventilator (data dasar) dan setelah 48 jam menggunakan ventilator. Kriteria KDIGO dan serum NGAL (*cut-off* > 150 ng/ml) digunakan untuk menentukan subjek mengalami GnGA.

Hasil: Lima puluh empat subjek memenuhi kriteria inklusi. Empat belas subjek drop out (DO) karena penggunaan ventilator < 48 jam. Empat puluh subjek diikutsertakan dalam analisis. Tiga subjek (7,5%) mengalami GnGA berdasarkan kriteria KDIGO. Dua puluh tiga subjek (57,5%) mengalami GnGA berdasarkan nilai NGAL. Terdapat hubungan antara PEEP 24 jam kedua terhadap kejadian GnGA ($p=0,010$). PEEP dengan nilai cut-off 6,5 cmH₂O (sensitivitas 66,7%, spesifisitas 18,9%, AUC 0,896) (95% CI 0,74-1,00 $p=0,024$) berisiko menyebabkan kejadian GnGA IRR 2,7 (95% CI 0,62-75,9), $p=0,115$).

Kesimpulan: PEEP dengan nilai $\geq 6,5$ cmH₂O merupakan faktor risiko GnGA. Volume tidal $\geq 5,5$ hingga 10 ml/kgbb ideal tidak berhubungan dengan kejadian GnGA, baik menggunakan kriteria KDIGO maupun serum NGAL.

Kata kunci: *positive end expiratory pressure* (PEEP), volume tidal (Vt), Gangguan ginjal akut (GnGA)

ABSTRACT

Risk factors of Positive End Expiratory Pressure (PEEP) and Tidal Volume for Acute Kidney Injury (AKI) in patients admitted to the Pediatric Intensive Care Unit (PICU)

Background: Incident of acute kidney injury (AKI) have been increased in critically ill children. Use of positive end expiratory pressure (PEEP) and tidal volume (TV) on mechanical ventilator known as risk factors for AKI.

Objective: To find out whether PEEP dan TV are risk factors AKI in patient who admitted in PICU.

Methods: A prospective cohort study was conducted in pediatric patients aged 1 month to <18 years in the PICU of Sardjito Hospital Yogyakarta, Indonesia, from May to October 2025. Subjects using ventilators with an estimated hospital stay of ≥ 48 hours were included in this study. Data on baseline characteristics of subjects (age, sex, nutritional status, indication for PICU admission, reason for ventilator use, fluid balance, diuresis, use of vasoactive drugs and furosemide) and the average PEEP and Vt used in the first 24 hours and the second 24 hours were collected. Serum creatinine and NGAL examinations were performed at the beginning of ventilator use (baseline data) and after 48 hours of ventilator use. KDIGO criteria and serum NGAL (cut-off > 150 ng/ml) were used to determine subjects with AKI.

Result: Fifty-four subjects met the inclusion criteria. Fourteen subjects were excluded due to ventilator use of <48 hours. Forty subjects were included in the analysis. Three subjects (7.5%) had AKI based on KDIGO criteria. Twenty-three subjects (57.5%) had AKI based on NGAL values. There was a relationship between the second 24-hour PEEP and the incidence of AKI ($p=0.010$). PEEP with a cut-off value of 6.5 cmH₂O (sensitivity 66.7%, specificity 18.9%, AUC 0.896) (95% CI 0.74-1.00 $p=0.024$) had a risk of causing AKI events IRR 2.7 (95% CI 0.62-75.9), $p=0.115$).

Conclusion: PEEP $\geq 6,5$ cmH₂O is a risk factor for AKI. TV is not as a risk factor for AKI. Tidal volume $\geq 5,5$ up to 10 ml/kg ideal body weight is not correlated with AKI using KDIGO nor NGAL criteria.

Keywords: positive end expiratory pressure (PEEP), tidal volume (TV), acute kidney injury (AKI)