

## Clinical characteristics of acute kidney injury in patients with glyphosate herbicide intoxication

전주예수병원 내과<sup>1</sup>, 전주예수병원 신장내과<sup>2</sup>

조봉주<sup>1</sup>, 조아영<sup>2</sup>, 이광영<sup>2</sup>, 선인오<sup>2</sup>

**Background/Aims:** This study aimed to investigate the clinical characteristics of acute kidney injury (AKI) in patients with glyphosate herbicide intoxication.

**Methods:** From 2008 to 2019, 172 patients admitted to our hospital after glyphosate herbicide poisoning. We evaluated the incidence, clinical characteristics, and severity of AKI based on the RIFLE classification.

**Results:** The patients included 117 men and 55 women with a mean age of 59 years (range, 22-101 years). Of the 172 patients, 68 had AKI during admission period. The incidence of AKI was 39.5%; of which, 21.5%, 11.0% and 7% were classified as Risk, Injury and Failure, respectively. Compared with patients in the non-AKI group, patients in the AKI group had lower serum bicarbonate level ( $17.9 \pm 5.1$  mmol/L vs.  $21.0 \pm 3.6$  mmol/L,  $p < 0.01$ ) and higher serum total bilirubin levels ( $0.83 \pm 0.70$  vs.  $0.64 \pm 0.40$  mg/dL,  $p = 0.034$ ). In comparison with patients of non-AKI group, patients with AKI experienced intubation (42.6% vs. 4.8%,  $p < 0.001$ ) and intensive unit care (61.8 % vs. 23.2 %,  $p < 0.001$ ) more frequently. The mortality rate was higher in AKI group than in non-AKI group (19.1 % vs. 1.0 %,  $p < 0.001$ ). In multiple logistic regression analysis, hyperbilirubinemia and hypotension on admission were significant predictors of AKI.

**Conclusions:** Serum total bilirubin concentration and blood pressure on admission is useful predictors for the development of AKI in patients with glyphosate herbicide intoxication.

Table 1. Comparison of baseline characteristics between non-AKI and AKI group

	Non-AKI (n=104)	AKI (n=68)	p-value
Age, years	57 ± 17	61 ± 17	0.206
Male, n (%)	64 (61.5)	49 (72.1)	0.104
Co-morbidity, n (%)			
Diabetes, n (%)	16 (15.4)	16 (23.5)	0.127
Hypertension, n (%)	26 (25.0)	27 (39.7)	0.031
Duration of hospital stay, days	7.2 ± 9.1	11.3 ± 12.7	0.015
Frequency of hypotension (systolic BP <90 mmHg), n (%)	4 (3.8)	25 (36.8)	<0.001
ICU care, n (%)	24 (23.2)	42 (61.8)	<0.001
Ventilator care, n (%)	5 (4.8)	29 (42.6)	<0.001
Serum creatinine (mg/dL)	0.92 ± 0.24	1.47 ± 1.32	<0.001
eGFR <sub>adm</sub> , ml/min/1.73m <sup>2</sup>	88.3 ± 26.4	64.3 ± 24.4	<0.001
Serum ALT (IU/L)	27.2 ± 18.9	74.1 ± 341.0	0.162
Serum bilirubin (mg/dL)	0.64 ± 0.40	0.83 ± 0.70	0.034
Serum albumin (mg/dL)	4.39 ± 0.60	4.34 ± 0.44	0.541
Total leukocyte count (× 10 <sup>3</sup> /mL)	11.3 ± 4.8	12.3 ± 5.4	0.226
Platelet count	252 ± 72	248 ± 68	0.718
Na	141 ± 3	141 ± 4	0.573
K	4.1 ± 0.5	4.7 ± 1.1	<0.001
HCO <sub>3</sub> <sup>-</sup>	21.0 ± 3.6	17.9 ± 5.1	<0.001
death, n (%)	1 (1.0)	13 (19.1)	<0.001

Table 2. Predictors of AKI (univariate and multivariate analysis)

	Univariate		Multivariate	
	HR (95% CI)	p-value	HR (95% CI)	p-value
Hypertension	1.950 (1.010-3.768)	0.047	1.730 (0.540-5.541)	0.356
history				
Total bilirubin	1.850 (1.007-3.398)	0.047	3.812 (1.188-12.23)	0.025
HCO <sub>3</sub> <sup>-</sup>	0.852 (0.788-0.921)	<0.001	0.995 (0.859-1.151)	0.944
Ammonia	1.004 (1.001-1.006)	0.004	1.003 (0.999-1.007)	0.135
Hypotension	14.39 (4.721-43.86)	<0.001	6.757 (1.246-36.64)	0.027
Amount	1.004 (1.001-1.007)	0.006	1.002 (0.998-1.007)	0.293