Prognostic factors in acute paraquat poisoning

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Background

Paraquat (PQ) is a widely used herbicide that is highly toxic to human. The aim of this study is to investigate the prognostic factors affecting survival in patients with paraquat poisoning.

Patients and Methods

This study included 788 PQ poisoning patients who were diagnosed by checking plasma paraquat concentrations from January 2005 till August 2012. We divided these patients into two groups (survivors vs non-survivors), compared clinical characteristics, and analyzed the predictors of survival.

Results

Table 1. The clinical and laboratory findings of the 788 patients with PQ poisoning

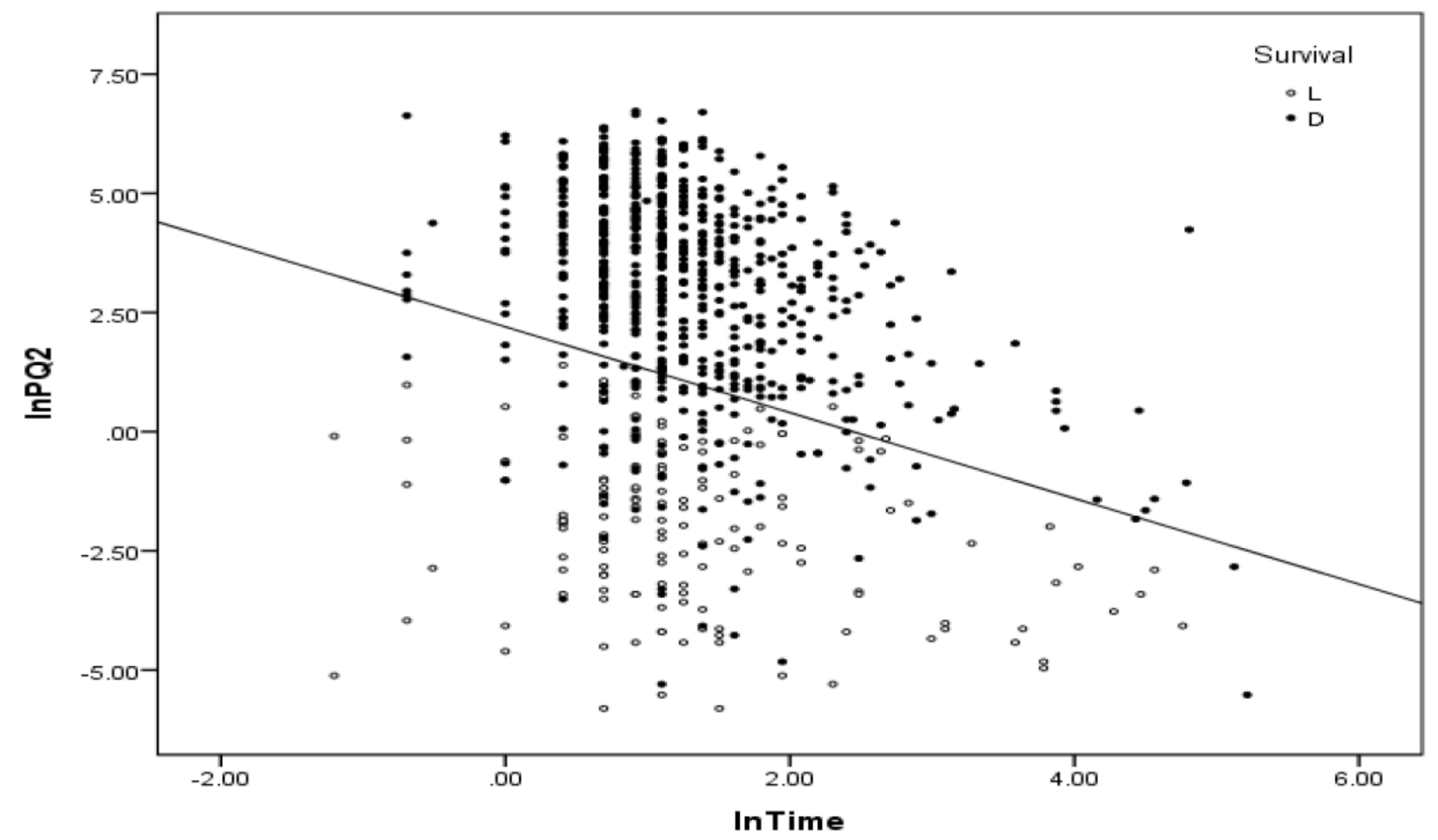|	Patients (N=788)
Age, years	57 ± 16
Male, n (%)	507 (64.1)
Time, hour	6.6 ± 15
HP therapy, n (%)	594 (75)
Serum creatinine (mg/dL)	1.71 ± 1.27
Serum aminotransferase (IU/L)	36 ± 50
Serum bicarbonate (mmol/L)	14.8 ± 6.8
Serum lipase (IU/L)	103 ± 184
Plasma PQ level (µg/mL)	65 ± 115
Amount of PQ ingested	151 ± 124

*HP : Hemoperfusion

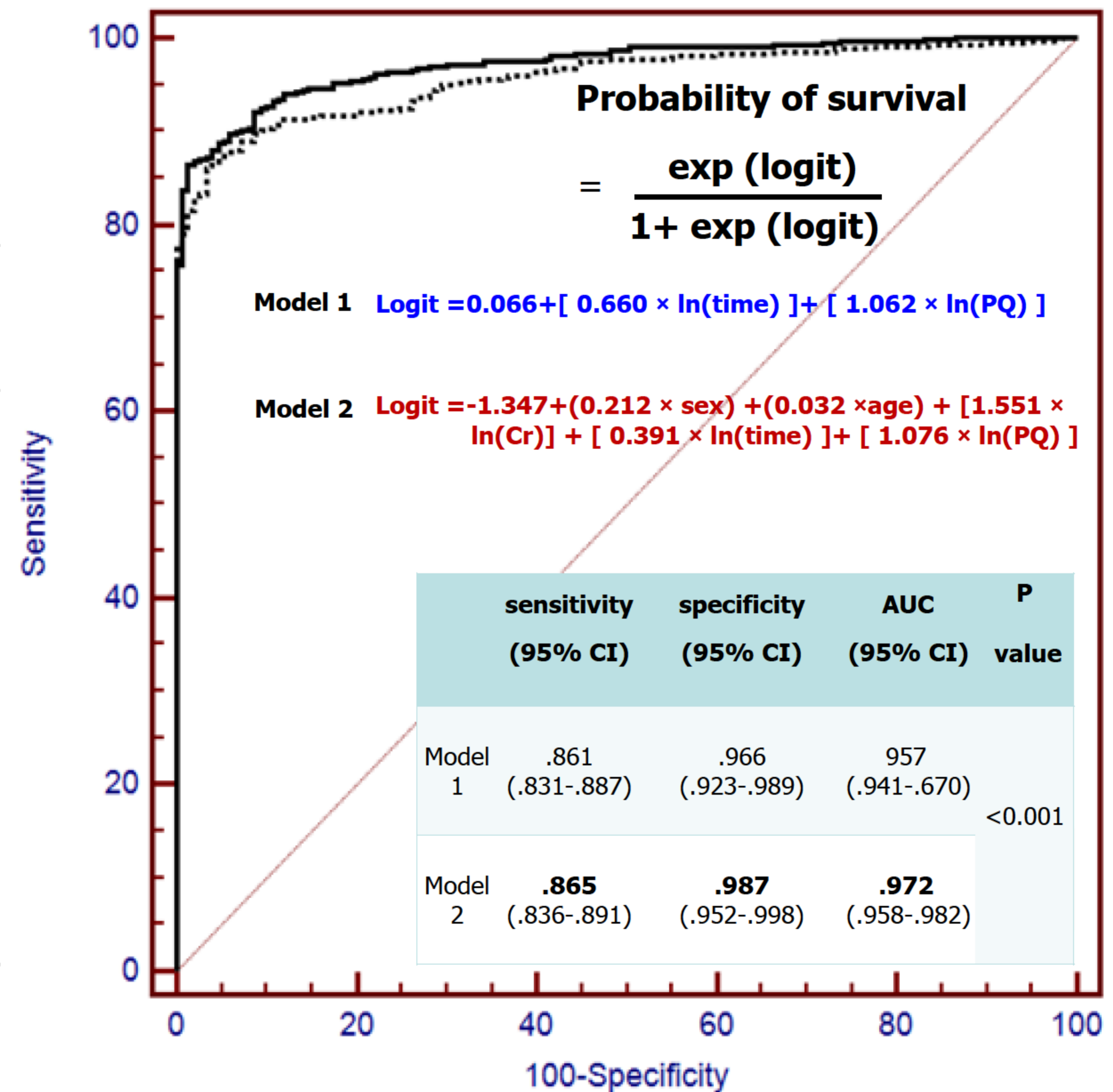### Table 2. Comparison of clinical characteristics between survivor and non-survivor

	Survivor (N=149)	Non-survivor (N=639)	p-value
Age, years	47 ± 14	59 ± 16	< 0.01
Male , n (%)	83 (56)	422 (67)	0.23
HP therapy , n (%)	141 (95)	453 (71)	< 0.01
Time, hour	8.71 ± 17.2	6.14 ± 14.4	NS
Serum lipase (IU/L)	46 ± 38	115 ± 200	< 0.01
Serum creatinine (mg/dL)	0.95 ± 0.92	1.88 ± 1.27	< 0.01
Plasma PQ level (µg/mL)	0.44 ± 0.7	80.3 ± 123.1	< 0.01
Amount of PQ ingested	34 ± 22	178 ± 22	< 0.01

Table 3. Multivariate logistic regression analysis

	B	Relative risk	95% CI Lower	95% CI Upper	P value
Age	0.032	1.27	1.012	1.053	0.01
ln(Cr)	1.551	4.72	2.553	8.715	< 0.01
ln(time)	0.391	1.48	1.048	2.085	0.03
ln(PQ)	1.076	2.93	2.406	3.573	< 0.01

Figure 1. Time concentration curve. Survivor have lower plasma PQ levels than that of non-survivor.

$$\text{Probability of survival} = \frac{\exp(\text{logit})}{1 + \exp(\text{logit})}$$

Model 1 $\text{Logit} = 0.066 + [\ 0.660 \times \ln(\text{time})\ ] + [\ 1.062 \times \ln(\text{PQ})\ ]$

Model 2 $\text{Logit} = -1.347 + (0.212 \times \text{sex}) + (0.032 \times \text{age}) + [1.551 \times \ln(\text{Cr})] + [\ 0.391 \times \ln(\text{time})\ ] + [\ 1.076 \times \ln(\text{PQ})\ ]$

	sensitivity (95% CI)	specificity (95% CI)	AUC (95% CI)	P value
Model 1	.861 (.831-.887)	.966 (.923-.989)	957 (.941-.670)	<0.001
Model 2	**.865** (.836-.891)	**.987** (.952-.998)	**.972** (.958-.982)	

Figure 2. In case of logistic regression using Ln (Cr), Ln (time), Ln(PQ) in our study (model 2), the sensitivity and specificity were 86 and 98%, respectively.

Summary and Conclusion

The survival rate was 18.9% in our study. The prognostic factors in this study were age, ln(time), ln(Cr), ln(PQ). We can predict the probability of survival through logistic regression using above variables.