

# Acute Illness with Extreme Hyperglycemia

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## Objectives:

To evaluate correlations between plasma glucose to glycated hemoglobin ratio (GAR) and clinical outcomes during acute illness.

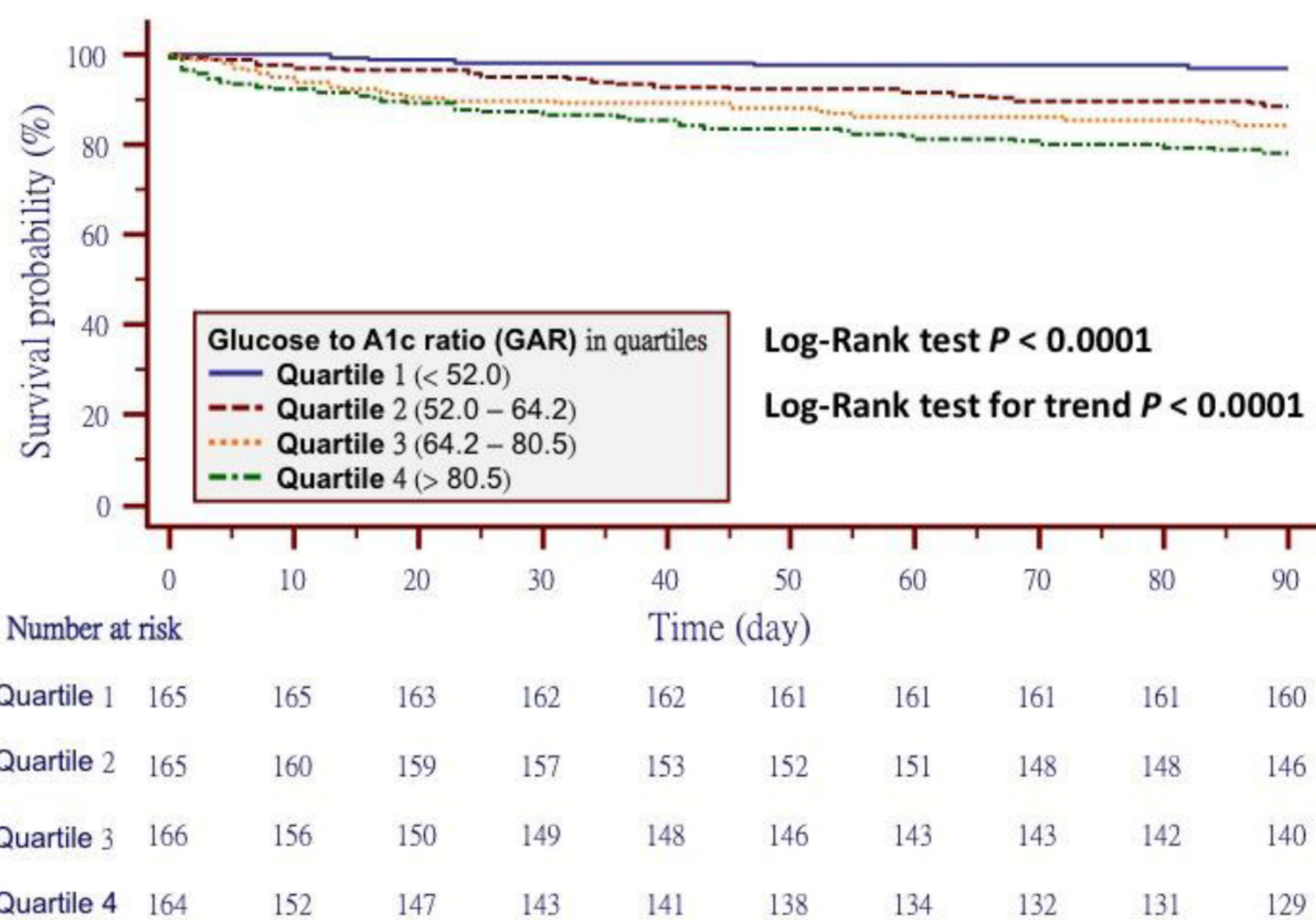
## Methods:

This is a retrospective, observational cohort study. We enrolled six hundred and sixty-one patients who visited the emergency department of our hospital between July 1, 2008 and September 30, 2010 with a plasma glucose concentration >500 mg/dl. Systolic blood pressure, heart rate, plasma glucose, white blood cell, neutrophil, hematocrit, blood urea nitrogen, serum creatinine, liver function, and plasma glucose concentration were recorded at the initial presentation to the emergency department. Data on glycated hemoglobin over the preceding 6 months were reviewed from our hospital database. Glucose to HbA1C ratio (GAR) was calculated as the plasma glucose concentration divided by glycated hemoglobin.

## Factors associated with 90-day all-cause mortality by Cox regression analysis

	Crude HR (95% CI) per 1-SD Increase		Adjusted HR (95% CI) per 1-SD Increase	
	HR (95% CI)	p value	HR (95% CI)	p value
GAR	1.41 (1.22-1.63)	<0.001	1.29 (1.05-1.57)	0.013
Age	1.55 (1.20-2.01)	0.001	1.63 (1.20-2.22)	0.002
Plasma glucose	0.89 (0.70-1.13)	0.328	-	-
SBP	0.45 (0.28-0.71)	0.001	0.70 (0.44-1.12)	0.132
Serum creatinine	1.19 (1.05-1.35)	0.005	1.15 (0.93-1.43)	0.206
Hct	0.63 (0.52-0.77)	<0.001	0.71 (0.56-0.91)	0.006
Platelet	0.76 (0.60-0.97)	0.030	0.87 (0.69-1.10)	0.251
ANC	1.29 (1.09-1.53)	0.003	1.05 (0.84-1.30)	0.678
CRP	1.41 (1.20-1.65)	<0.001	1.31 (1.06-1.62)	0.013

90-day survival probability stratified by GAR quartile. There was a significant trend toward decreasing survival from Q1 to Q4 (log-rank test for trend p<0.0001).



## Results:

The GAR of those who died was significantly higher than in the survivors ( $81.0 \pm 25.9$  vs.  $67.6 \pm 25.0$ ,  $p < 0.001$ ). There was a trend toward a higher 90-day mortality rate in the patients with a higher GAR (log-rank test for trend  $p < 0.0001$ ). In multivariate Cox regression analysis, GAR was significantly related to 90-day mortality (hazard ratio [HR] 1.41, 95% confidence interval [CI]: 1.22-1.63,  $p < 0.001$ ), but not plasma glucose (HR: 0.89, 95% CI: 0.70-1.13,  $p = 0.328$ ). The rates of intensive care unit admission and mechanical ventilator use were also higher in those with a higher GAR.

## Conclusions:

GAR independently predicted 90-day mortality, intensive care unit admission, and use of mechanical ventilation. It was a better predictor of patient outcomes than plasma glucose in patients with extremely high glucose levels.

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