



# Cerebrospinal Fluid Complement Fixation Titer as a Predictor of Outcome in Coccidioidal Meningitis

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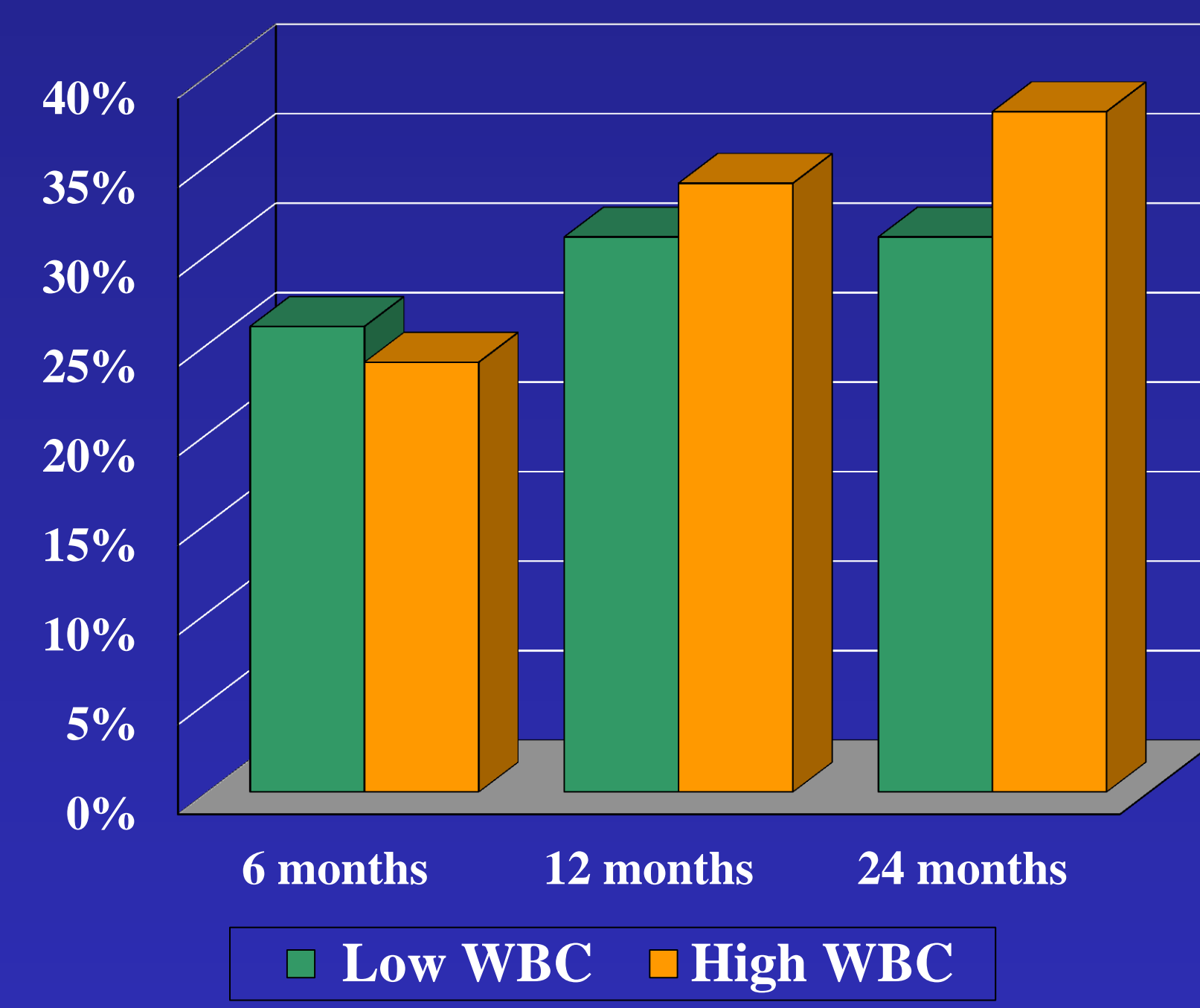
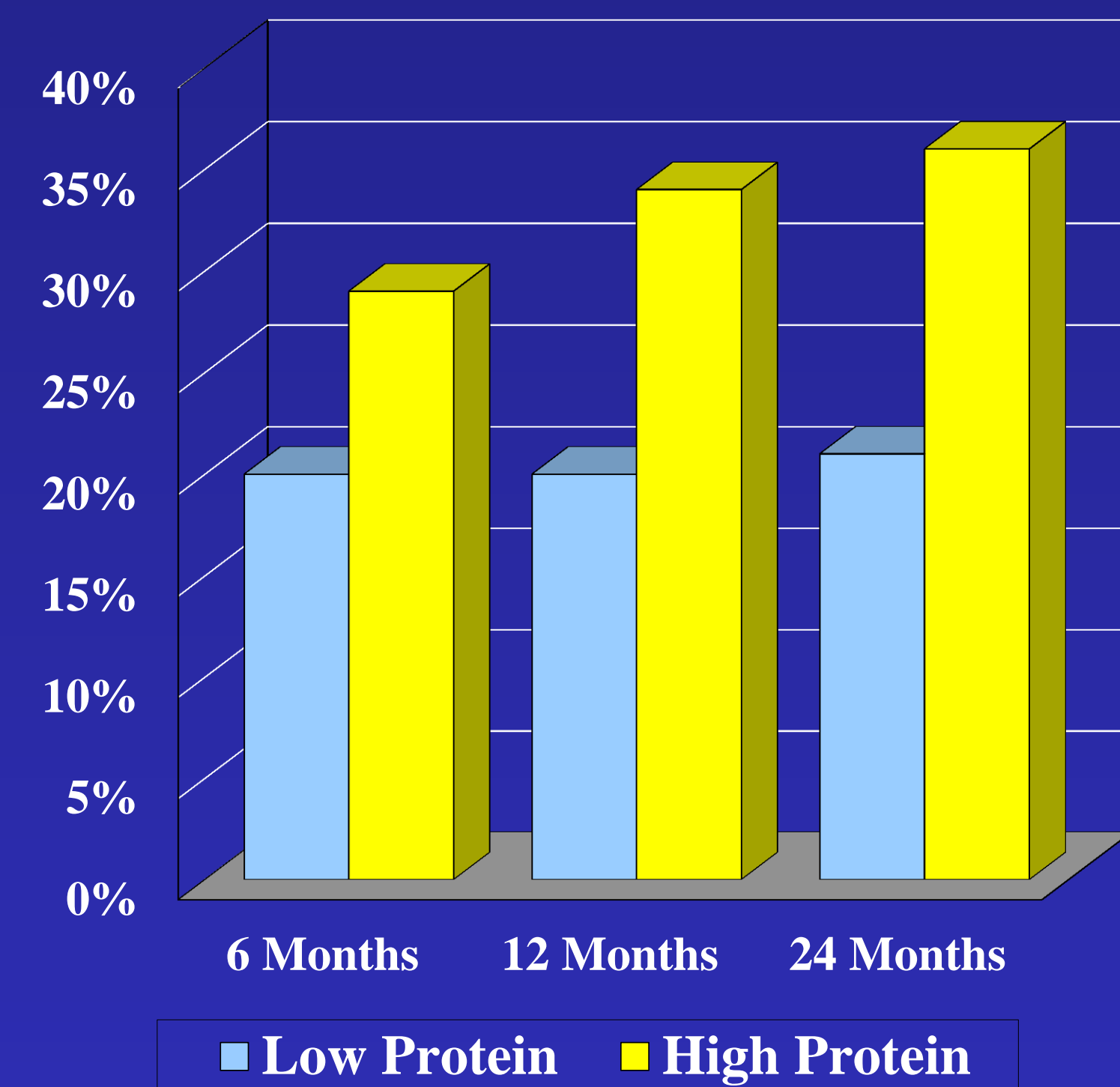


## Background

- Cerebrospinal fluid (CSF) pleocytosis, differential, protein glucose and complement fixation titers have traditionally been used in diagnosis and prognosis of coccidioidal meningitis (CM)
- Previous studies have observed increased CSF protein (Figure 1) and pleocytosis (Figure 2) with mortality across a twenty-four month period

Figure 1: Laaly et al; CSF Protein and mortality

Figure 2: Laaly et al; CSF WBC and Mortality



## Objective

- To evaluate the complement fixation titer (CF) as a predictor of morbidity and mortality in CM

## Methods

- IRB Approved
- Retrospective review: 148 patients registered in coccidioidomycosis clinic at Kern Medical Center (KMC) from 1987 - 2010
- CF titers were converted to 2<sup>n</sup> log
- Analysis: SAS JMP 8.0 Oneway ANOVA test
- Correlation: Mortality, Hydrocephalus, Seizure, Cerebrovascular infarction, Arachnoiditis, and Cerebral hemorrhage.
- Individual CF titers by mortality were assessed with Epi info<sup>®</sup> for chi square

## Results

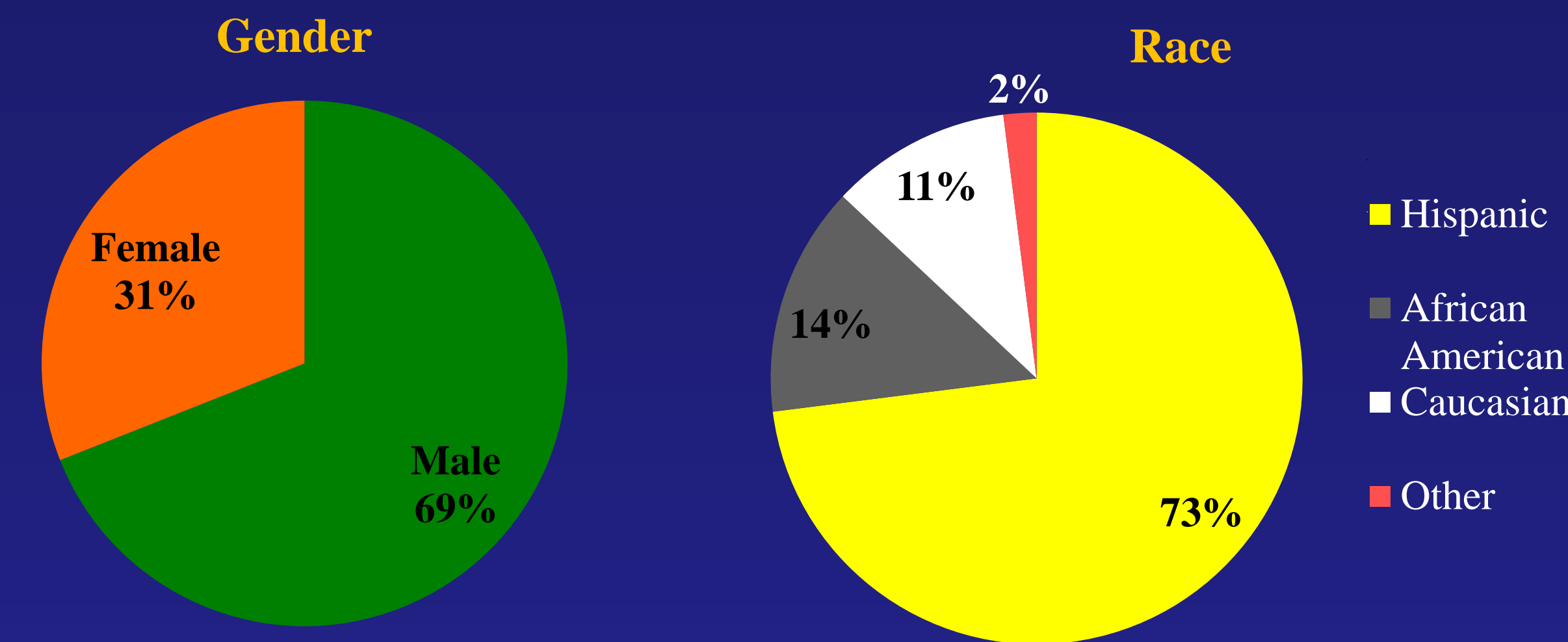


Figure 3: Demographics

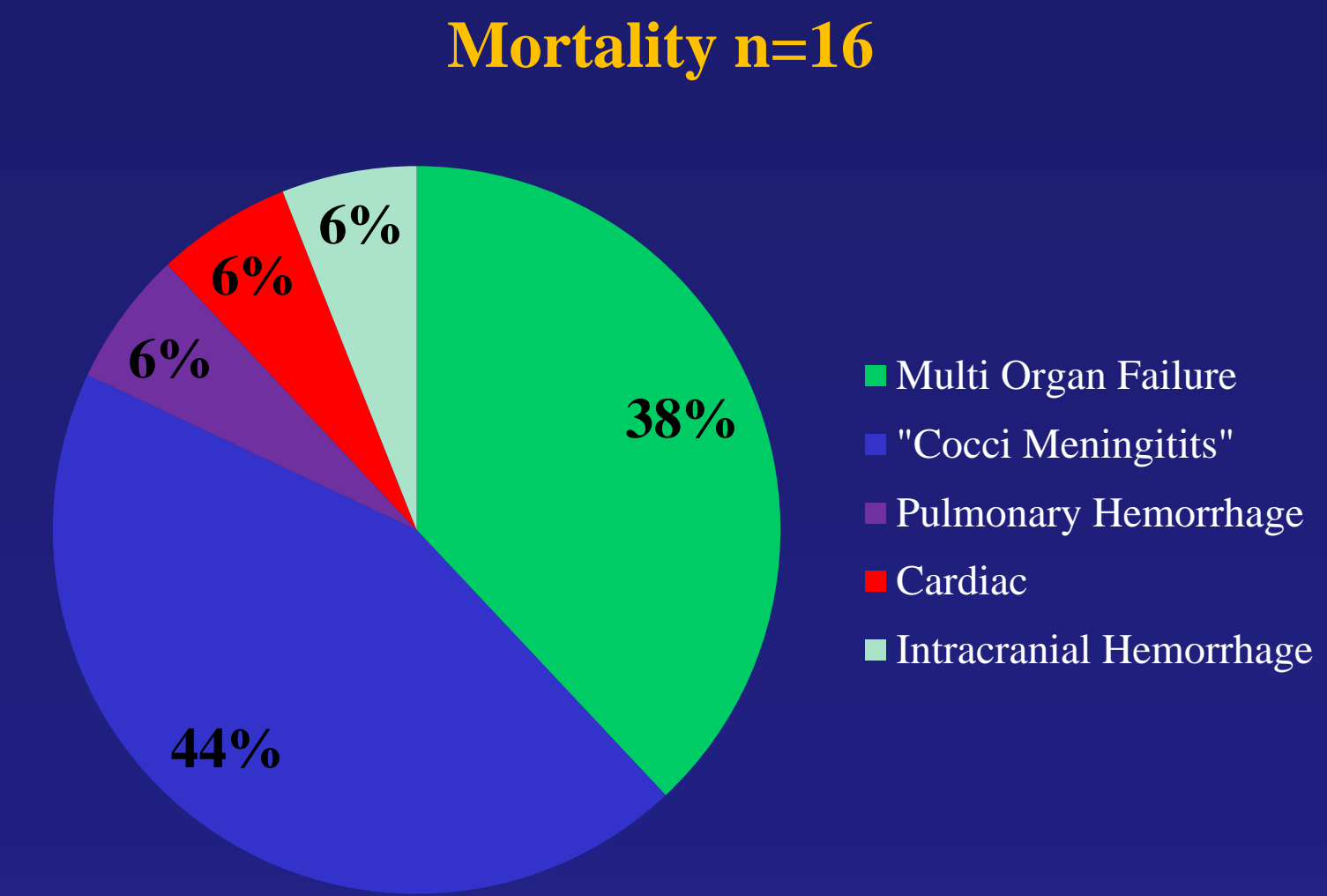


Figure 4: Causes of Mortality

- The distribution of male to female was 69% and 31% (Figure 3)
- Average age was 34 (14-34) with 73% Hispanic, 14% African American, 11% Caucasian and 2% other (Figure 3)
- Coccidioidal meningitis was the most common cause of death (Figure 4)

Table 1: Analysis of CSF CF Titers for Co morbidities and Mortality

	Incidence	Mean (2 <sup>n</sup> )	Standard Deviation	p
Mortality n=90	no	5.5(4.9-6.0)	0.27	0.0497
	yes	6.8(5.6-7.9)	0.56	
Hydrocephalus n=117	no	5.3(4.7-5.8)	0.29	0.18
	yes	5.6(5.2-6.5)	0.32	
Cerebrovascular Infarction n=116	no	5.3(4.8-5.9)	0.26	0.12
	yes	6.0(5.3-6.9)	0.40	
Arachnoiditis n=118	No	5.4(5.0-5.9)	0.25	0.63
	yes	5.7(4.8-6.6)	0.46	
Seizures n=118	No	5.6(5.1-6.0)	0.32	0.94
	yes	5.5(4.5-6.5)	0.52	
Cerebral Hemorrhage n=116	No	5.6(5.1-6.0)	0.23	0.65
	yes	5.5(4.2-6.4)	0.56	

- Mortality was significantly higher in patients with CF titers of  $\geq 1:64$  (Table 1, Figure 5, Figure 6)
- Survival among CM patients is significantly higher in those with CF titers of  $\leq 1:4$  in their initial CSF (Table 2, Figure 6)
- Incidence of hydrocephalus and cerebrovascular infarction was increased in patients with higher CF titers, but not statistically significant (Table 1)

Table 2: Analysis of CSF CF Titers by Survival



CF Titer	OR 95 CI	p
$\leq 1:2$	7.39 (1.44 - 50.79)	0.0048
$\leq 1:4$	6.25 (1.63-26.00)	0.0017
$\leq 1:8$	2.68 (0.79-9.25)	0.0746
$\leq 1:16$	2.91 (0.70-11.88)	0.0860
$\leq 1:32$	2.21 (0.39-11.49)	0.2860
$\leq 1:64$	1.37 (0.17-8.51)	0.7150
$\leq 1:128$	1.58 (Invalid)	0.7000
$\leq 1:256$	4.87 (0-191.2)	0.2300

CSF CF

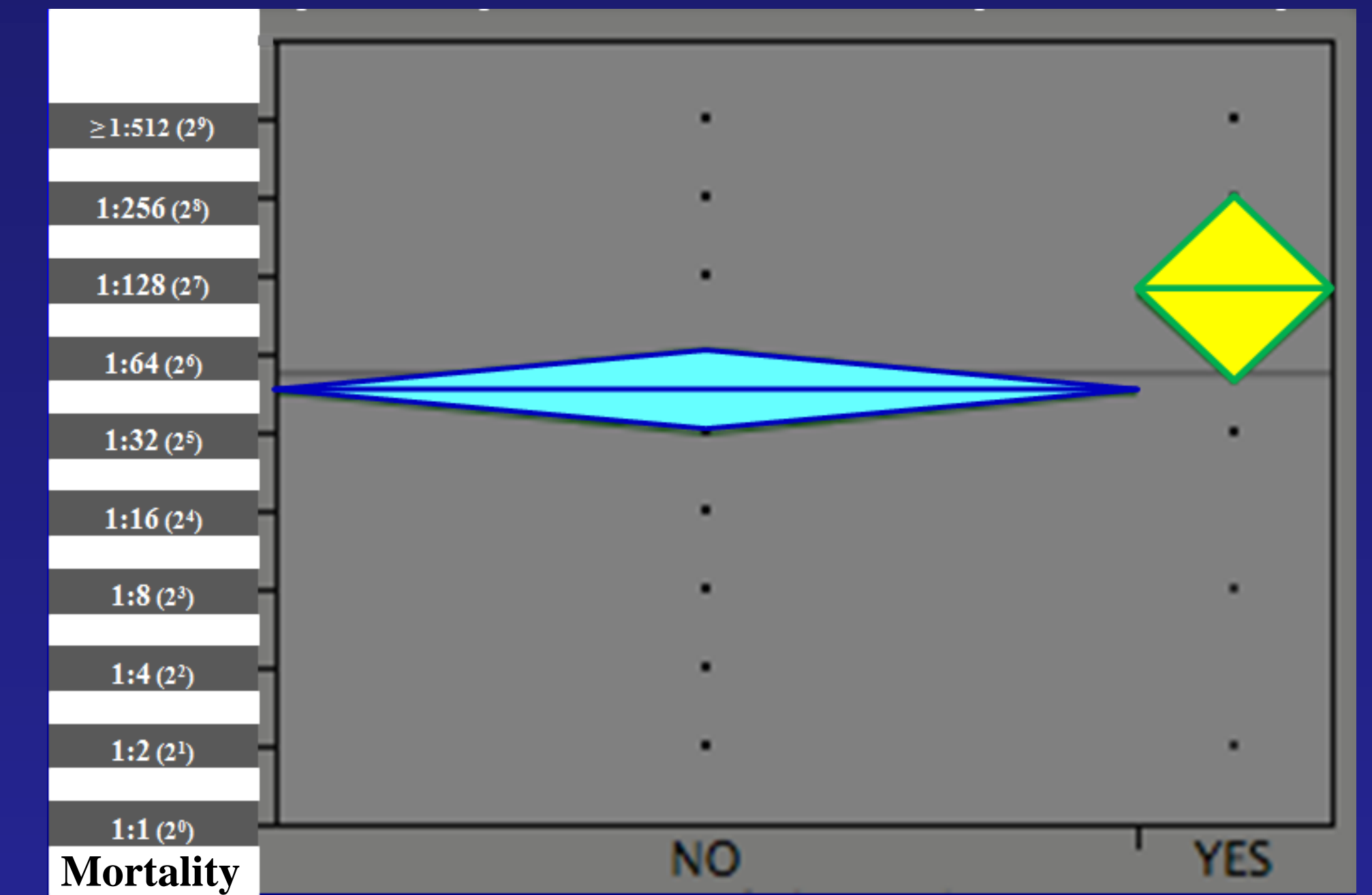


Figure 5: Oneway Analysis of CSF CF by Mortality

CSF CF

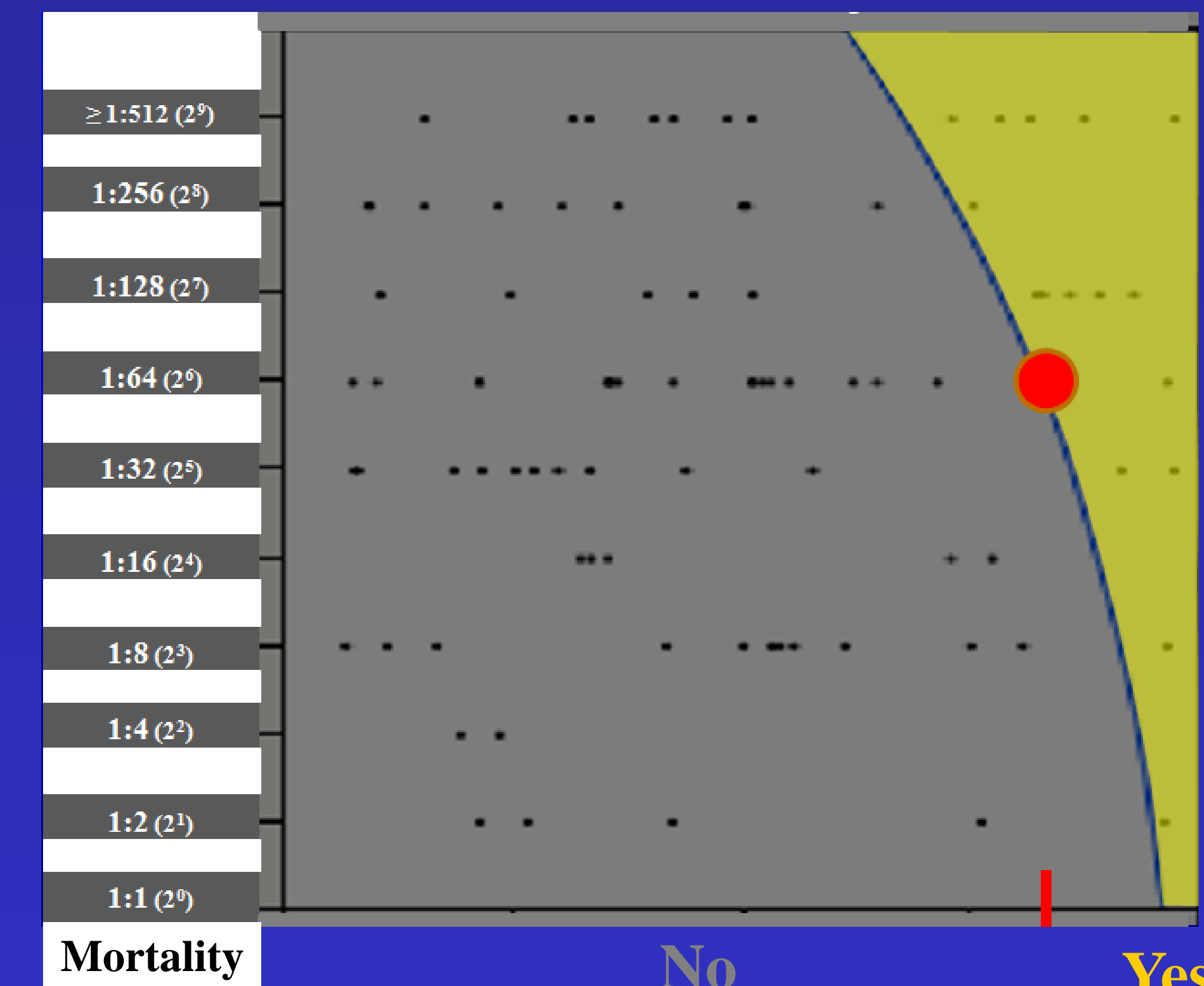


Figure 6: Logistic Fit of Mortality and CSF CF

## Conclusion

- Initial level of cerebrospinal fluid complement fixation titer is a predictor of mortality.
- There is a trend for increased incidence of hydrocephalus and cerebrovascular infarction with higher titers.
- There is no statistical significance for arachnoiditis, seizures, and cerebral hemorrhage