

# Incidence and risk factors of exposure keratopathy in critically ill patients in an academic hospital complex - a cohort study

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## Introduction

Exposure keratopathy (EK) is injury to the cornea occurring from prolonged exposure of the ocular surface to the outside environment. Critically ill patients are vulnerable to develop EK. Untreated EK may lead to corneal scarring and permanent visual impairment. This study investigated the incidence, prevalence and risk factors for EK in critically ill patients in the intensive care units (ICUs) of two academic hospitals in Pretoria.

## Methods

In this prospective observational study, the eyes of 129 patients were examined upon admission to adult ICUs. The examination was repeated on day five of ICU stay in patients without admission EK. EK on admission was regarded as prevalence, whilst development of EK on day five was regarded as incidence. Mechanical ventilation, eyelid position, presence of a blink reflex, sequential organ failure assessment (SOFA) score and fluid balance were compared in patients with and without EK using a Fisher's exact test or a two-sample t-test as appropriate. Multivariate logistic regression analysis was performed to identify risk factors for EK.  $P < 0.05$  was considered statistically significant in all analyses.

## Results

Five of the 129 patients examined at admission had EK (prevalence of 3.9%). Of the 80 patients examined on day five, 15 had EK (incidence of 18.8%). On multivariate logistic regression analysis, an absent blink reflex (odds ratio 6.78; 95% confidence interval 1.50 to 30.77) and a higher SOFA score (odds ratio 1.38; 95% confidence interval 1.06 to 1.61) were strongly associated with the development of EK after ICU admission. A positive fluid balance and the need for ventilation predicted the development of EK perfectly.

## Conclusion

EK is already prevalent in a proportion of critically ill patients at ICU admission. EK has a high incidence after ICU admission with mechanical ventilation, a positive fluid balance, an absent blink reflex and an increase in SOFA score as the main risk factors. We recommend the implementation of a simple eye care protocol based on the risk factors found in this study and a follow-up study to evaluate its effectiveness. Further studies should also evaluate the long-term outcome of EK patients.

### Bivariate (unadjusted) and multivariate (adjusted) logistic regression analysis of factors associated with the development of EK after ICU admission

	UNADJUSTED OR (95% CI)	P-VALUE	ADJUSTED OR (95% CI)	P-VALUE
Mechanical ventilation	$\infty$		$\infty$	
Absent blink reflex	11.23 (3.01 - 41.9)	0.002	6.78 (1.50 - 30.77)	0.013
Incomplete eye closure	176 (17.95 - 1725)	<0.001	*	
Median SOFA Score <sup>a</sup>	1.43 (1.19 - 1.73)	<0.001	1.38 (1.06 - 1.61)	0.001
Fluid balance	$\approx$		$\approx$	

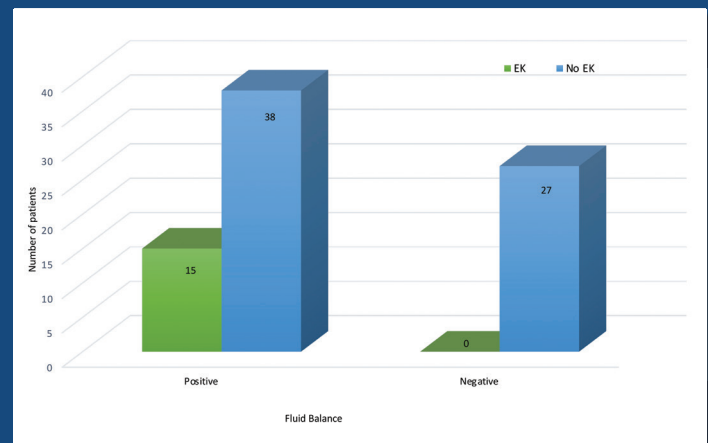
\* Due to 0 non-ventilated patients developing EK, odds ratio not calculable. Ventilation predicts the development of EK perfectly.

<sup>a</sup> Due to severe collinearity between absent blink reflex and incomplete eye closure, incomplete eye closure was omitted from the multivariate analysis to avoid instability of model.

<sup>b</sup> 1 point increase in the median SOFA score.

<sup>c</sup> Due to 0 patients with a negative fluid balance developing EK, odds ratio not calculable. A positive fluid balance predicts the development of EK perfectly.

### Relationship between fluid balance and development of EK



### Relationship between blink reflex and development of EK

