

# PREDICTIVE VALUE OF THE HYPOXIA INDEX IN ELDERLY PATIENTS WITH CHRONIC CARDIORENAL SYNDROME

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## Background:

Anemia in chronic kidney disease (CKD) and chronic heart failure (CHF) is an independent predictor of mortality. In CKD the response of the kidney to hypoxia is inadequate.

#### <u>Objectives</u>:

The aim of this study was to investigate predictive value of the hypoxia index in elderly patients with chronic cardiorenal syndrome.

#### <u>Methods</u>:

80 elderly patients with CHF (32 males and 48 females, mean age 70.7±8.7 years) were examined. CHF was defined according to Acute and Chronic Heart Failure ESC Guidelines, 2016. Chronic kidney disease (CKD) was diagnosed and classified according to the KDIGO guidelines (2012). Serum levels of N-terminal propeptide of type B natriuretic hormone (NT-proBNP), hypoxia-inducible factor 1-alpha (HIF-1 $\alpha$ ), endogenous erythropoietin (eEPO) were assessed. The hypoxia index was calculated (the ratio of endogenous erythropoietin to HIF-1 $\alpha$ ; priority certificate No. 2021110399). The follow-up period was 12 months; the primary endpoint was total mortality.

## <u>Results</u>:

CKD with estimated glomerular filtration rate (eGFR) < 60 ml/min/1.73m2 was diagnosed in 49 (61.3%) elderly patients with CHF. Anemia was observed in every fifth patient with CHF (21.3%).The hypoxia index was 90.5 (34.9; 176.8) mlU/ng in elderly patients with CHF and increased with age (p=0.03). HIF-1 $\alpha$  in elderly patients was not associated with the presence of CKD (p=0,7). Patients with chronic cardiorenal syndrome had higher levels of eEPO (8.2 (IQR 2.4; 16.5) and 4.9 (IQR 1.9; 7.9) mlU/ml resp., p=0.02) and the hypoxia index (137.8 (IQR 36.3; 261.6) and 66.5 (IQR 30.1; 121.7) mlU/ng, resp., p=0.03). There are no significant correlations between the hypoxia index with NT-proBNP (r=0.21, p=0.06). The hypoxia index was significantly higher in the group of deceased patients than in the survivors (74.1 (IQR 32.5; 158.8) and 157.1 (IQR 75.4; 464.2) mlU/ng, p=0.0004), as well as the level of HIF-1 $\alpha$  (0.08 (IQR



0.06; 0.11) and 0.05 (IQR 0.04; 0.07) ng/ml, p = 0.02) and eEPO (16.92 (ICR 5.43; 64.57) and 5.36 (IQR 1.65; 8.85) mIU/ml, p <0.0001).The hypoxia index more than 287 mIU/ng (AUC = 0.96; p = 0.018) was associated with higher annual mortality in elderly patients with CHF (OR 12.2; 95% CI 2.62–56.84; p=0.0014).

# Conclusion:

Patients with CHF and CKD have higher level of the hypoxia index (the ratio of endogenous erythropoietin to HIF-1 $\alpha$ ). The level of hypoxia index more than 287 pg/ml predicted annual mortality in elderly patients with chronic cardiorenal syndrome.