Are serum erythropoietin levels associated with eGFR in Mexican kidney transplant recipients?

Lucino Bahena Carrera, Carlos Adrián Chávez Mendoza, Jéssica Reyes Lara, Miguel Eduardo López Chico, César Ulises Ramírez Salgado, Sagrario Castillo Juárez, Héctor Faustino Noyola Villalobos.

Istanbul, Turkey

September 22, 2024

H.C.M.

THE TRANSPLANTATION SOCIETY · SOCIÉTÉ DE TRANSPLANTATION · 1966

In Person + Live Streaming

TTS 2024 ISTANBUL TURKEY

September 22-25

+ Virtual October 21-23

SEDENA

SECRETARÍA DE LA DEFENSA NACIONAL

I have no conflict of interest to report.

Introduction

Introduction: The production of erythrocytes is regulated by the hormone erythropoietin (EPO), which maintains the blood haemoglobin (Hb) levels.

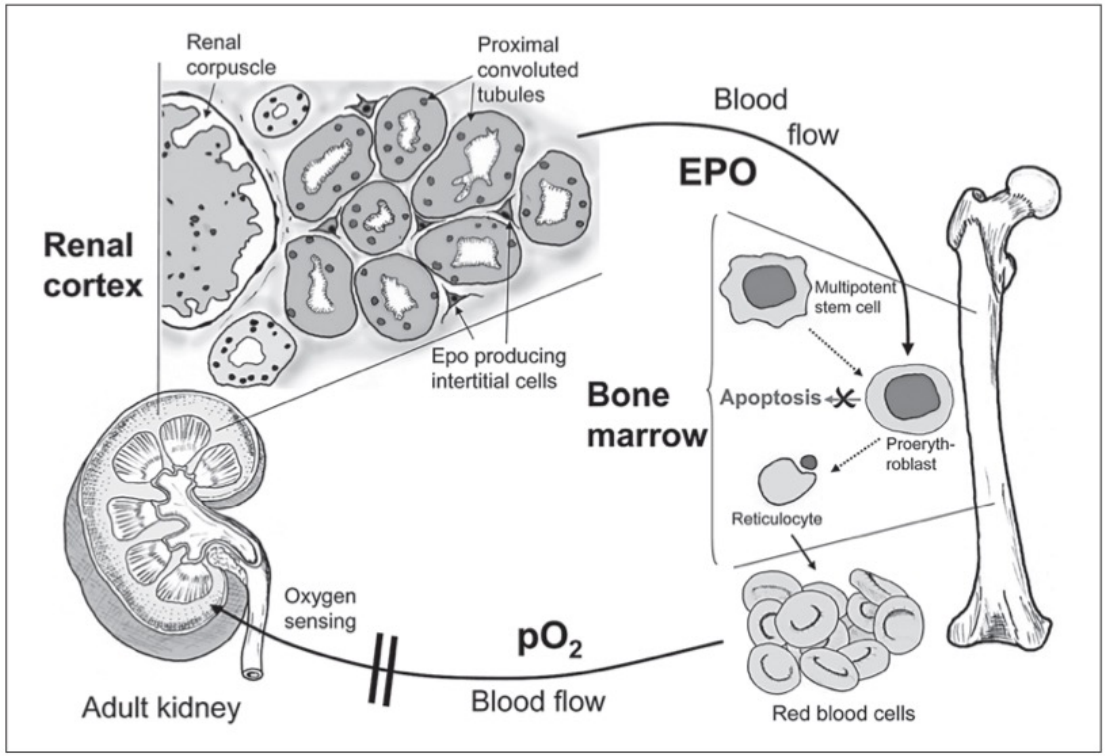

Fig. 1. EPO endocrine feedback loop. Regulation of adult erythropoiesis by renal EPO based on the O_2 supply to the tissues.

Lombardero M. Pathobiology 2011;78:41–53
Panteja M et al. J Med Biochem 2017; 36 (2).

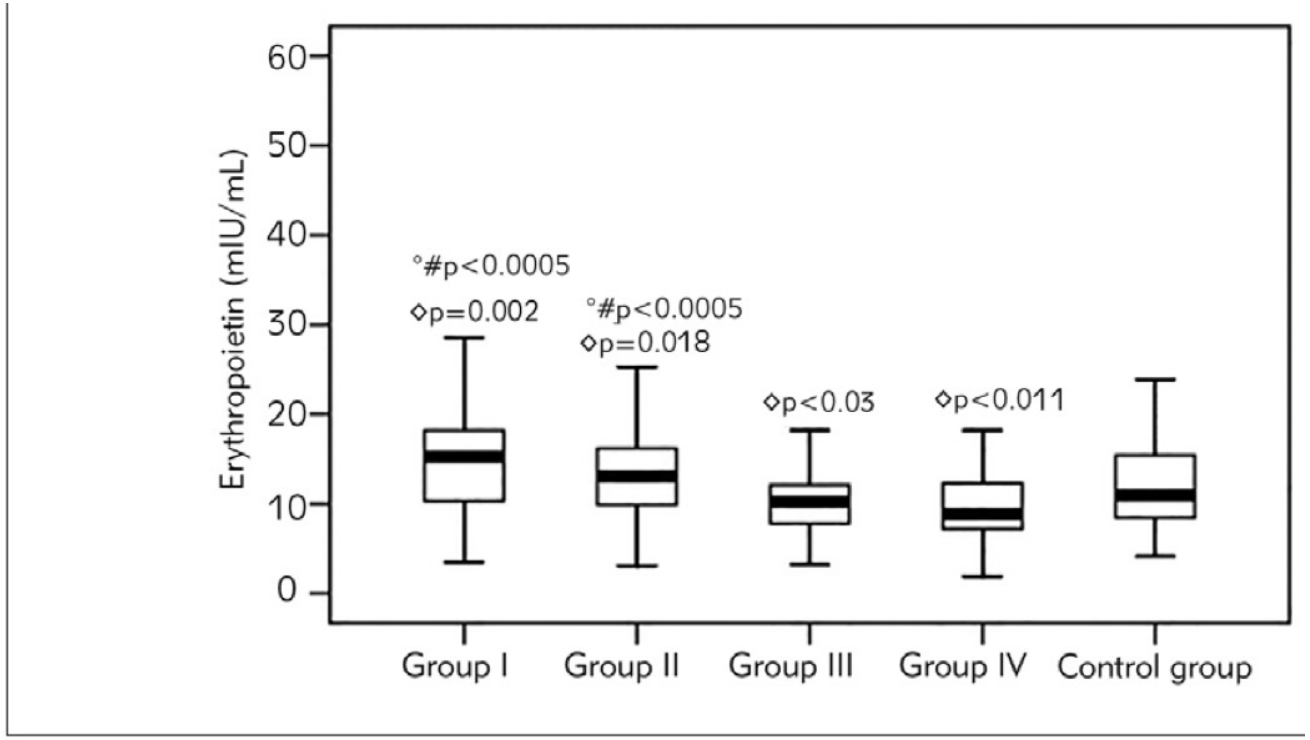

Figure 3 Box-and-whisker plots of erythropoietin concentration (mIU/mL) in the studied groups.

Panjeta M et al showed that in patients with native kidneys and CKD, GFR positively correlated with Hb and EPO levels, but there aren´t studies that have described this correlation in kidney transplant recipients.

Method

Observational, analytical, transversal and prospective study from January 2021 to February 2023.

Were included all G5 KDIGO chronic kidney patients who completed 3 years post-transplant during the study period at Central Military Hospital, Mexico, City.

All subjets were divided into 4 subgroups according to their GFR.

Serum iron kinetics and erythropoietin levels were determined.

The Kolmogorov-Smirnov test was performed to determine the normality of the variables, data was reported as median and interquartile range (IQR); descriptive and analytical statistics were performed with Xi^2, Kruskal Wallis test and ANOVA tests. $p< 0.05$ was statistically significant.

Results

n	114
Age (year)	42.4 (± 12.75)
Sex	
Female	43% (*n*=49)
Male	57% (*n*=65)
Urea (mg/dL)	50.35 (± 23.8)
Cr (mg/dL)	1.55 (± 0.11)
GFR (ml/min/1.73 m²BS)	67.83 (± 23.21)
Albumin (g/dL)	4.39 (± 0.33)
Hemoglobin (g/dL)	14.65 (± 4.39)
Hematocrit (%)	43.1 (± 6.4)
Ferritin (ng/mL)	123.9 (± 10.7)
Serum iron level (mcg/dL)	101.0 (± 31.57)
Total iron binding capacity-TIBC (mcg/dL)	278.5 (± 72.61)
Transferrin saturation index-TSI (%)	36.53 (± 10.06)
Erythropoietin level (IU/L)	10.77 (± 5.18)
GFR (ml/min/1.73 m²BS)	*n*
Quartile 1 (≥ 90)	21
Quartile 2 (60 ≥ GFR ≤ 90)	46
Quartile 3 (30 ≥ GFR ≤ 60)	39
Quartile 4 (≤ 30)	8
Erythropoietin level (IU/L)	
Quartile 1	11.40 (± 3.98)
Quartile 2	11.19 (± 5.58)
Quartile 3	10.37 (± 5.41)
Quartile 4	8.63 (± 4.48)
GFR (ml/min/1.73 m²BS)	
Quartile 1	100.5 (± 6.4)
Quartile 2	76.2 (± 8.26)
Quartile 3	49.1 (± 8.52)
Quartile 4	25.0 (± 3.8)

Table 1. Baseline clinical and biochemical kidney transplant recipient characteristics.

Were included 114 kidney transplant recipients.

On average, kidney grafts are functional, defined by a GFR ≥ 60 ml/min/1.73 m²BS.

Whole parameters levels of iron kinetics are normal in our kidney transplant recipients including EPO levels.

Results

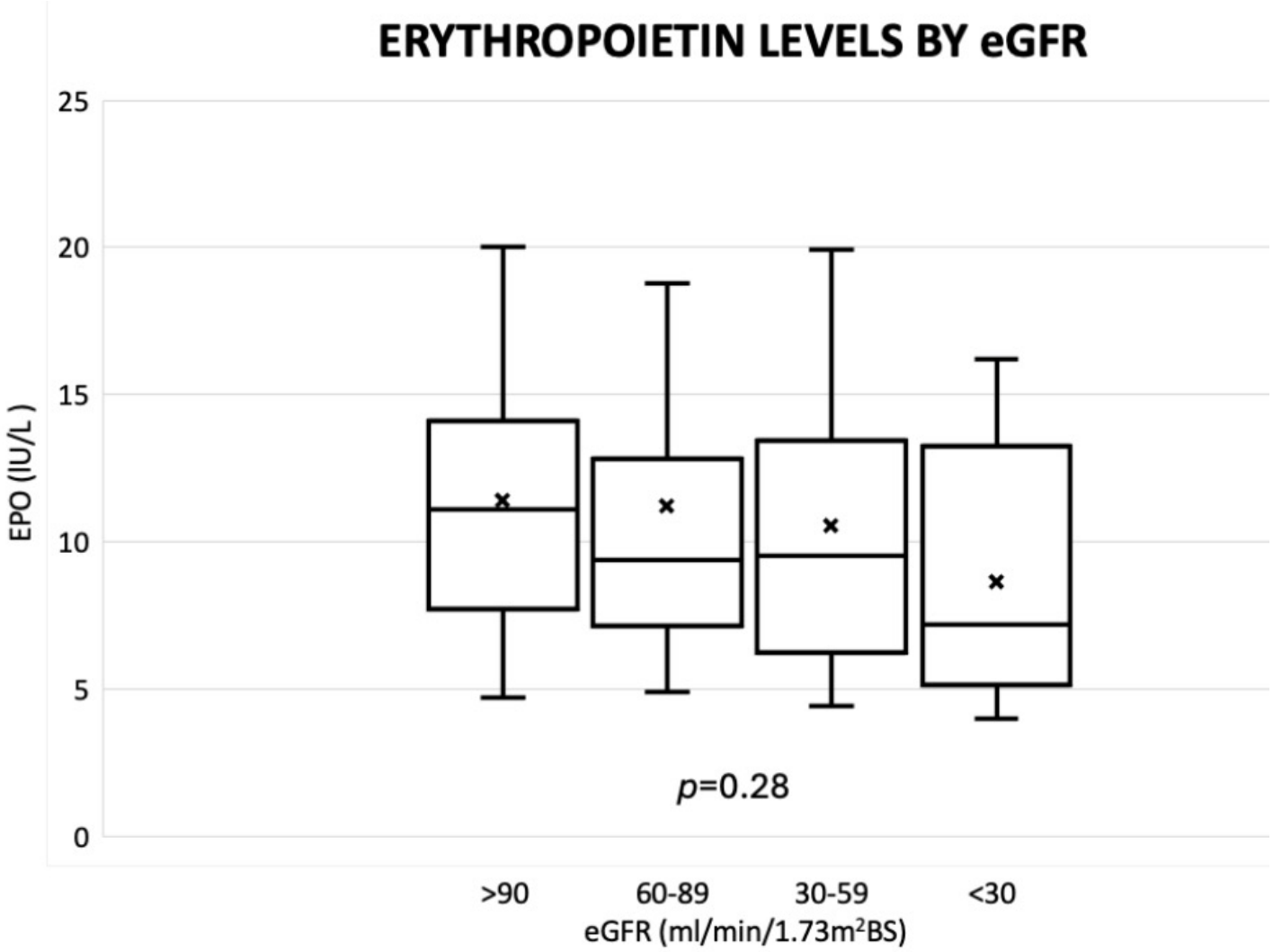

Figure 1. Box plot. Correlation between serum EPO levels and eGFR in kidney transplant recipients.

There was a correlation trend but without statistical significance between Hb and serum EPO levels ($p=0.051$), but not between EPO levels and eGFR ($p=0.28$).

Furthermore, we demonstrate an inverse correlation between the creatinine level and the EPO levels ($p<0.001$).

Discussion

Milkos ZN reported in 886 prevalent kidney transplant recipients the erythropoietin mean was 10.85 IU/L, similar to our results.

In native kidneys, EPO deficiency begins early in the course of CKD, but when eGFR ≤ 30 ml/min/1.73 m^2BS this deficiency increases.

Sinnamon KT et al found a significant negative correlation between hemoglobin levels and EPO (Pearson's correlation coefficient, R=-0.29, p< 0.001) but there was no significant correlation between EPO levels and eGFR (R=0.02, p=0.74) in kidney transplants, similar to our results.

Conclusion

In mexican kidney transplant recipients, the EPO level doesn´t correlate with eGFR.

This implies that graft function isn´t the main determinant of serum EPO levels in renal transplant recipients and other factors such as hypoxia-inducible factor (HIF) and hepcidin levels should be analyzed in future prospective studies.