

Energetic Cost of Protein Turnover in Chronic Kidney Disease

Sivakumar Sridharan¹, Kenneth Smith², Enric Vilar^{1,3}, Justin Roberts³, Ken Farrington^{1,3}

¹Lister Hospital, Stevenage, ²University of Nottingham, ³University of Hertfordshire

Introduction

Kidneys play an important role in energy metabolism and whole body protein turnover.

The aim of this study was to examine the alterations in protein turnover in advanced chronic kidney disease (CKD) and to calculate the energetic cost of protein turnover.

Study Protocol

❖ 5 pre-dialysis CKD (eGFR < 20ml/min) and 6 haemodialysis (HD) patients were enrolled in the study

❖ Protein intake was estimated using prospective food diaries prior to the study day

❖ Anthropometric data was collected from direct measurements. Resting energy expenditure (REE) was measured using indirect calorimetry

❖ Whole body protein turnover (WBPT) was measured using continuous infusion of ¹³C – leucine stable isotope over 3 hours

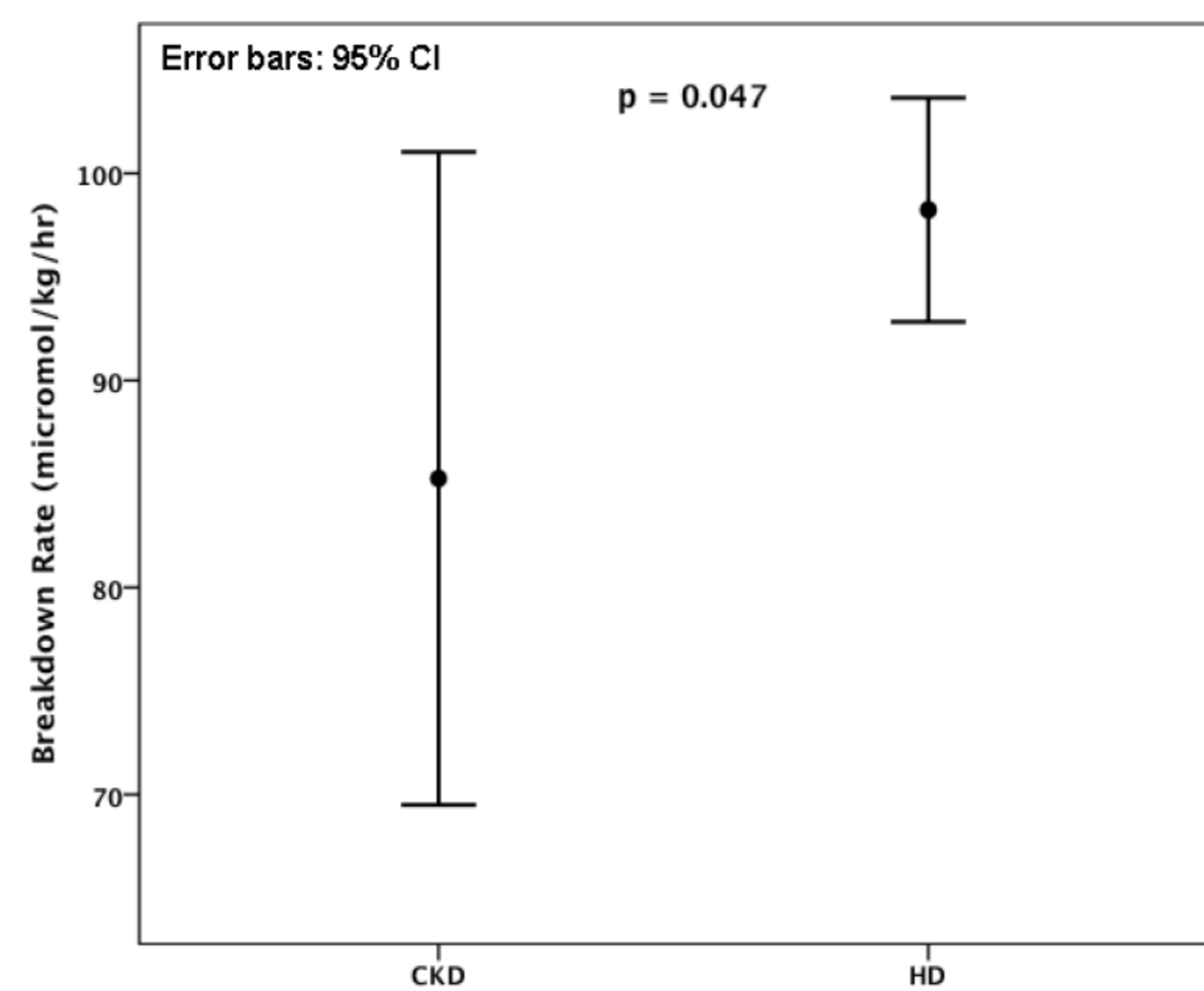
❖ Blood and breath samples were collected at specified intervals and analysed for isotopic enrichment of α-ketoisocaproate and carbon dioxide.

Demographics

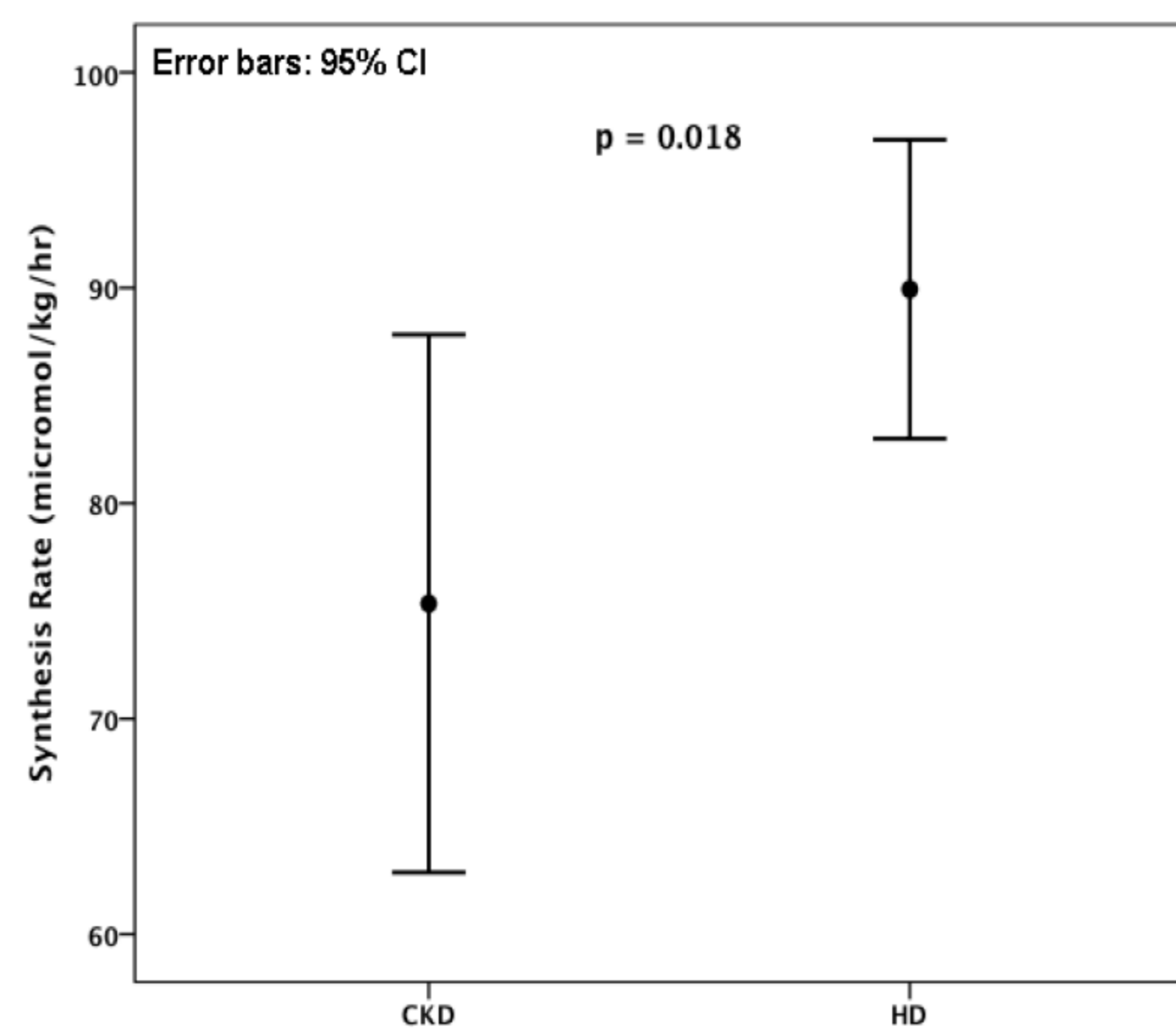
Number	11
Males : Females	5 : 6
Age (years)	65.3 ± 8.2
Mean Weight (kg)	73.8 ± 8.9
Mean Protein intake (g/kg/day)	0.94 ± 0.21
Mean REE (kcal/day)	1317 ± 225

Results

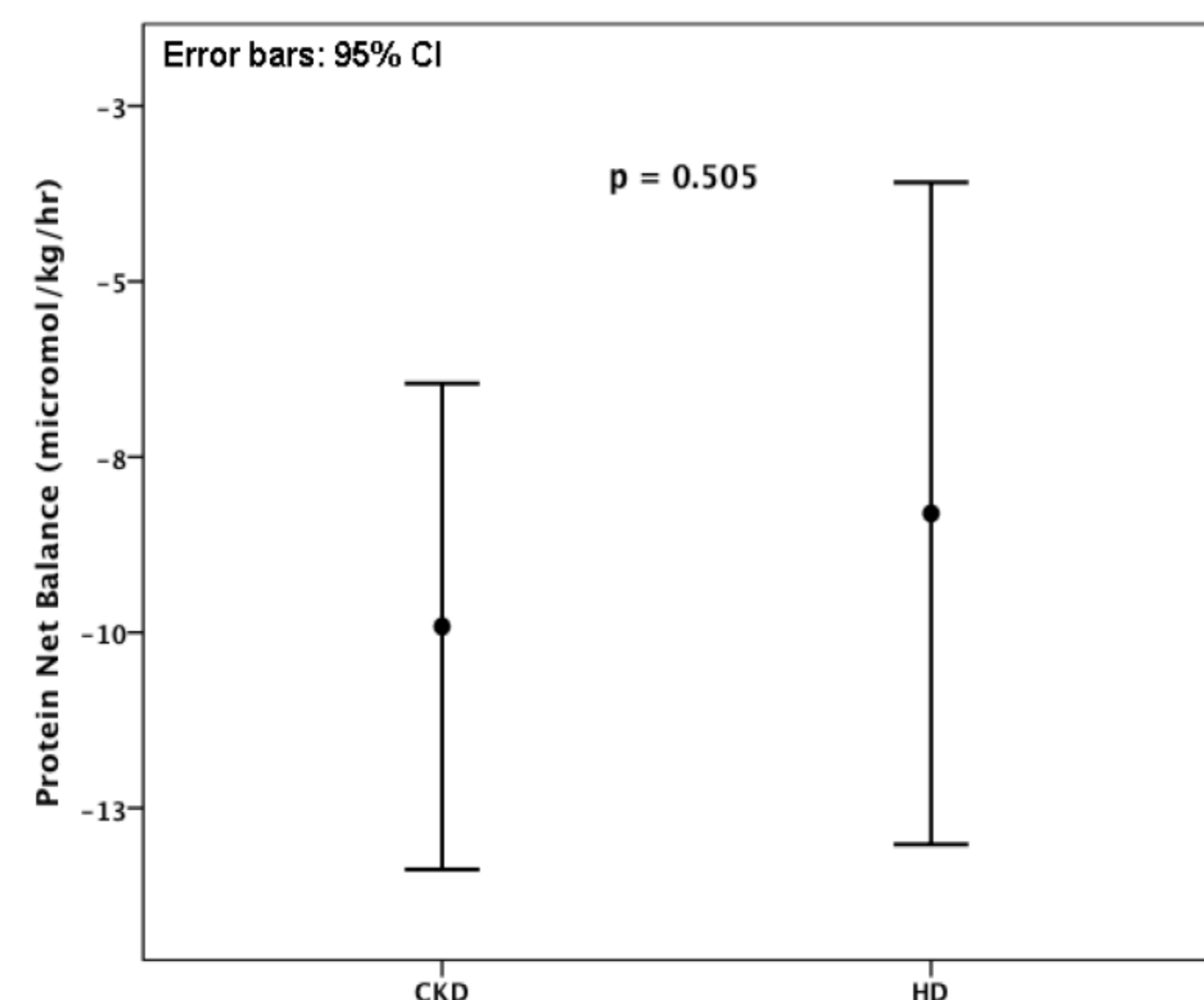
Protein Breakdown Rate



Protein Synthesis Rate

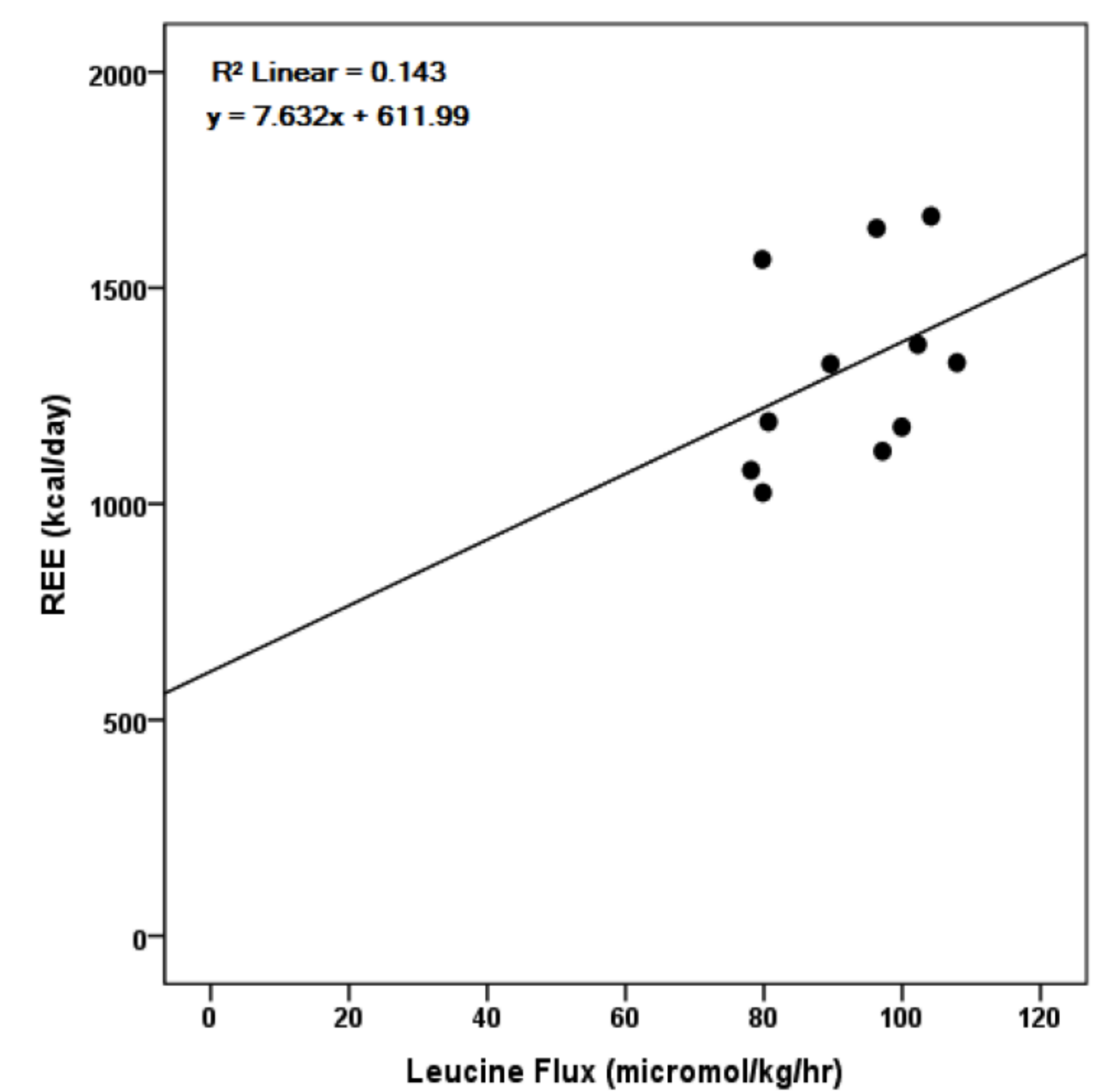


Net Balance of Protein Turnover



Results

Leucine Flux and REE



❖ There was no difference in age, body size parameters and protein intake between the CKD and HD groups.

❖ Both protein synthesis and breakdown rates were significantly higher in HD group compared to CKD group

❖ There was no significant difference in the Net protein balance between the groups

❖ The mean energy expenditure associated with whole body protein turnover was 705 (± 85) kcal/day. This equates to a mean energetic cost of 55% of resting energy expenditure per day for whole body protein turnover.

Conclusion

❖ HD patients have significantly higher rates of whole body protein turnover compared to CKD group.

❖ There was no difference in protein intake between the CKD and HD groups

❖ Such low protein intake combined with higher rates of protein turnover may increase the risk of malnutrition in HD patients

❖ The energetic cost of whole body protein turnover was comparable to that of healthy general population.