

# Characterisation of Functional Impairment of Uremic Cardiomyopathy

Chinnappa S<sup>1,2,3</sup>, Mooney A<sup>2</sup>, El Nahas AM<sup>4</sup>, Tu YK<sup>1</sup>, Tan LB<sup>1</sup>

<sup>1</sup>University of Leeds, <sup>2</sup>Leeds Teaching Hospitals NHS Trust, <sup>3</sup>Sheffield Teaching Hospitals NHS Trust, <sup>4</sup>University of Sheffield, United Kingdom

**INTRODUCTION:** A large observational study has demonstrated that reduced renal function is associated with cardiac structural abnormality but not with cardiac functional impairment.<sup>1</sup> Like many others, they measured indices of resting cardiac performance but true cardiac dysfunction is better shown during peak stress. KDIGO identified assessment of asymptomatic cardiac dysfunction in chronic kidney disease (CKD) as a research priority, which can be addressed by measuring peak cardiac power output ( $CPO_{max}$ )<sup>2</sup>, a direct representation of the integrated function of heart. We tested the hypothesis that asymptomatic CKD patients without any known primary cardiac diseases (CVD) or diabetes mellitus (DM) have cardiac impairment compared to healthy controls.

## METHOD

In a cross sectional study of male subjects, 60 CKD patients [22 CKD stages 2&3, 17 CKD 4 and 21 CKD 5 (pre-dialysis)] without any primary cardiac disease or DM were compared with 101 healthy male volunteers by undertaking symptom-limited exercise testing to measure  $CPO_{max}$ . As a positive control, data from 39 age- and gender-matched HF patients in NYHA class II & III were also obtained.  $CPO_{max}$  was obtained non-invasively during cardiopulmonary exercise test using standard  $CO_2$  rebreathing technique. Results are given as mean $\pm$ SD and standard statistical analysis methods applied.

## RESULTS

All subjects performed exercise well above the anaerobic threshold with a mean peak respiratory exchange ratio of  $1.15\pm 0.09$ . None of them had inducible cardiac ischaemia during the test. The mean eGFRs of CKD 2&3, CKD 4 and CKD 5 groups were  $55.7\pm 17.5$  ml/min,  $21.7\pm 3.9$  ml/min and  $12.3\pm 2.4$  ml/min respectively. Compared to healthy controls, the CKD patients showed a graded reduction in  $CPO_{max}$  with  $92.2\pm 11.7\%$  of predicted  $CPO_{max}$  in CKD 2&3 ( $P=0.03$ ),  $87.4\pm 10\%$  in CKD 4 ( $P=0.0001$ ) and  $77.5\pm 13.5\%$  in CKD 5 ( $P<10^{-6}$ ). These values were not as impaired as in HF patients who had  $45.5\pm 10.7\%$  of predicted  $CPO_{max}$  ( $P<10^{-6}$ ) (Fig 1).

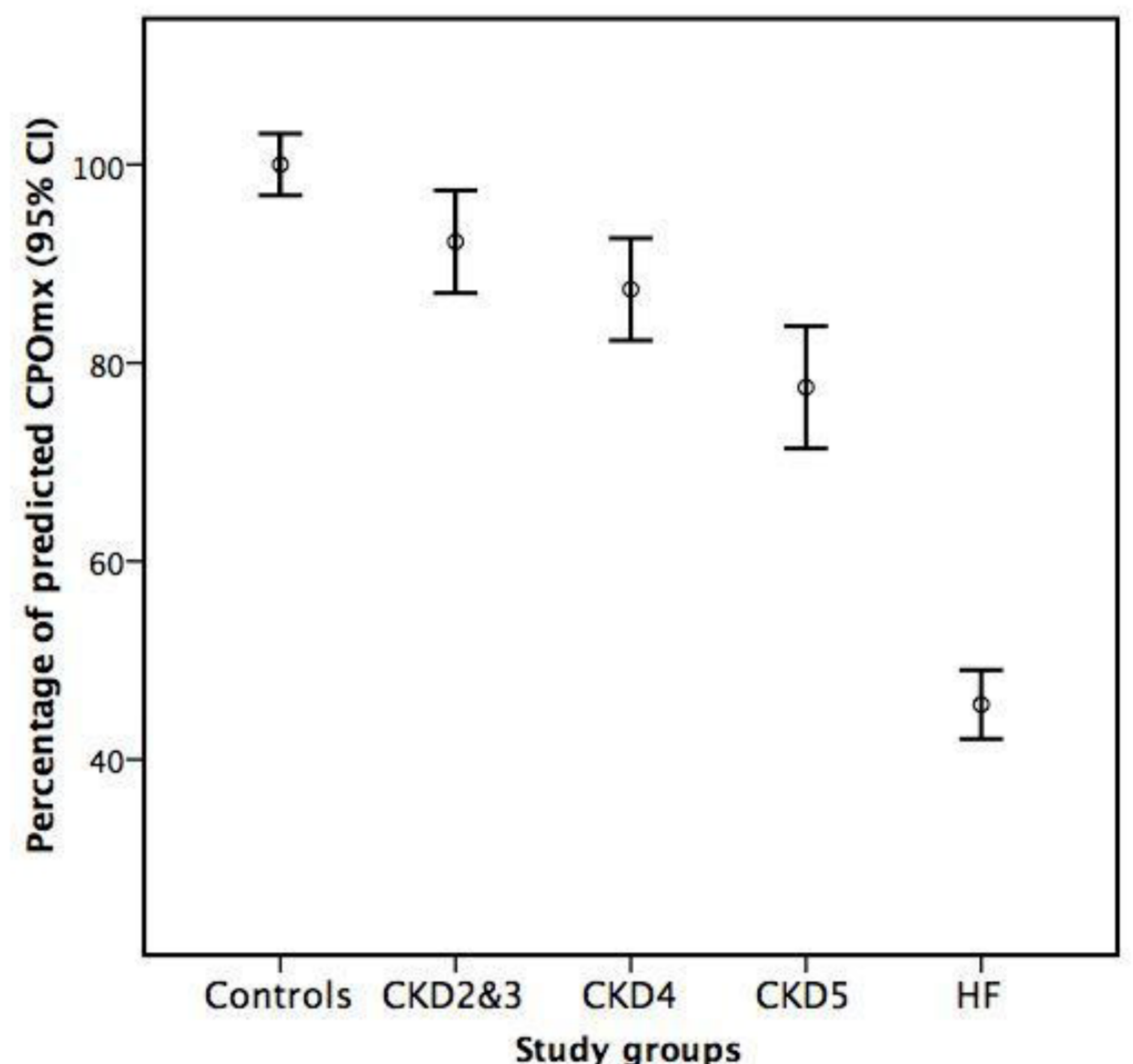


Fig 1: Graph showing graded decline in CPO<sub>max</sub> across the study groups

## CONCLUSIONS

The results show a first clear evidence of asymptomatic cardiac dysfunction associated with reduced renal function even in the absence of primary cardiac disease and DM. Future such evaluations have potential applications in characterising uremic cardiomyopathy and finding therapeutic strategies to reverse it.

## REFERENCES

- <sup>1</sup>Park et al, JASN 23:1725
- <sup>2</sup>Chinnappa S et al, *Expert Rev Cardiovasc Ther* 12(2):127

We thank Yorkshire Kidney Research Fund and Sheffield Kidney Research Foundation for supporting the project