Development of Renal Disease in Aboriginal People in a Remote Australian Community: a Probable Model of Oligonephronia

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Background and Aim

Kidney disease, marked by albuminuria, and resulting in renal failure, is very common in Australian Aboriginal people in remote areas. Biopsy and autopsy findings are compatible with low nephron endowment. We describe renal profiles followed over time in one high risk group, and interpret them in terms of disease "incidence".

Methods

Urine ACR and eGFR (Schwartz formula for those <18 yr) were measured at a baseline community screen, (>80% participation), and measured again or imputed (for renal failure) in the same people 10 to 14 years later. Changes in ACR and eGFR between screens were assessed.

This report includes 470 persons age 10 to <41 years at the first screen who had recorded birthweights. Figure 1 shows that these birthweights were generally low : 45% of older and 20% of younger participants subjects had been babies of low birthweight (<2.5 kg).

As shown in Figure 2, ACRs were higher in females than males. At both screens, older people had higher levels than younger people. In addition, ACR increased in individuals over the follow up period. This deterioration in ACR was reflected, in each age group, in lower proportions of subjects on the second versus the first screen with ACR <1 g/mol and ACR <3.4 g/mol (microalbuminuria threshold).

Two expressions of "incident" albuminuria were developed. These were defined levels of ACR≥1 g/mol, and of ACR≥3.4 g/mol detected on the second screen in people with ACR below those respective levels at the first screen. Rates of incident ACR were evaluated by age and sex in context of birthweight and baseline eGFR.

Results

In people with ACR<1 at the first screen, 74% of females and 59.7% of males had developed ACR≥1 g/mol by the second screen. In people with ACR<3.4 at the first screen, 44.6% of females and 27.3% of males had developed ACR≥3.4 g/mol by the second screen.

Incident ACR>=1 g/mol and incident ACR>=3.4 g/mol were both inversely correlated with birthweight and with levels of eGFR at baseline, in both sexes.. Figures 3A-3D show some expressions of those relationships. This applied even in the youngest subjects, children & adolescents. In some multivariate models, both birthweight and eGFR were significantly and independently inversely correlated with incident ACR >=1 g/mol or >=3.4 g/mol.

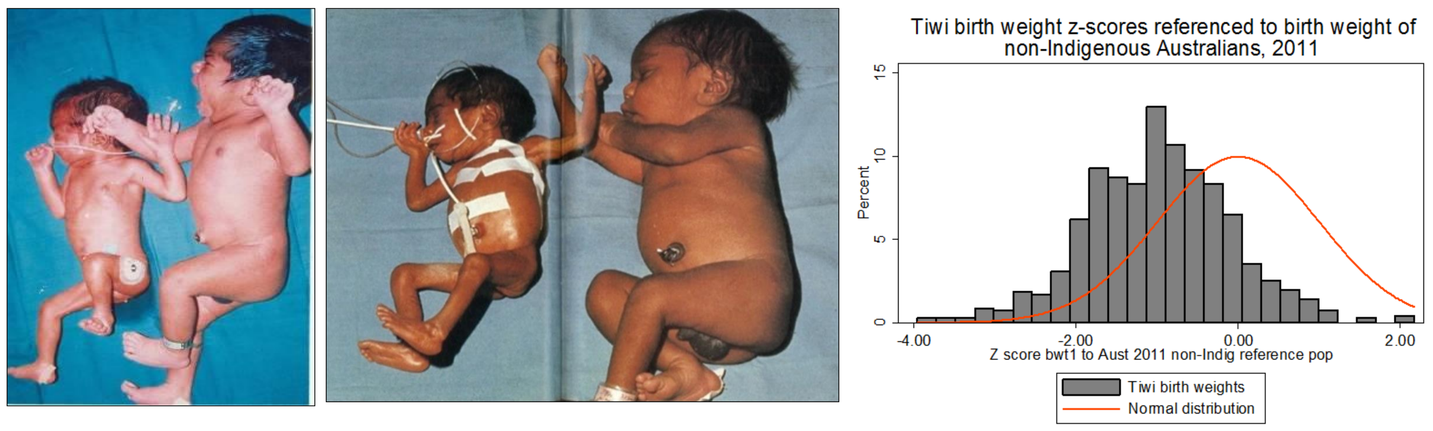
Figures 4A & 4B show contributions of baseline eGFR to the two expressions of incident ACR in females and males.

After development of "incident" disease, baseline levels of ACR themselves become the strongest predictors of further progression of ACR and of loss of eGFR.

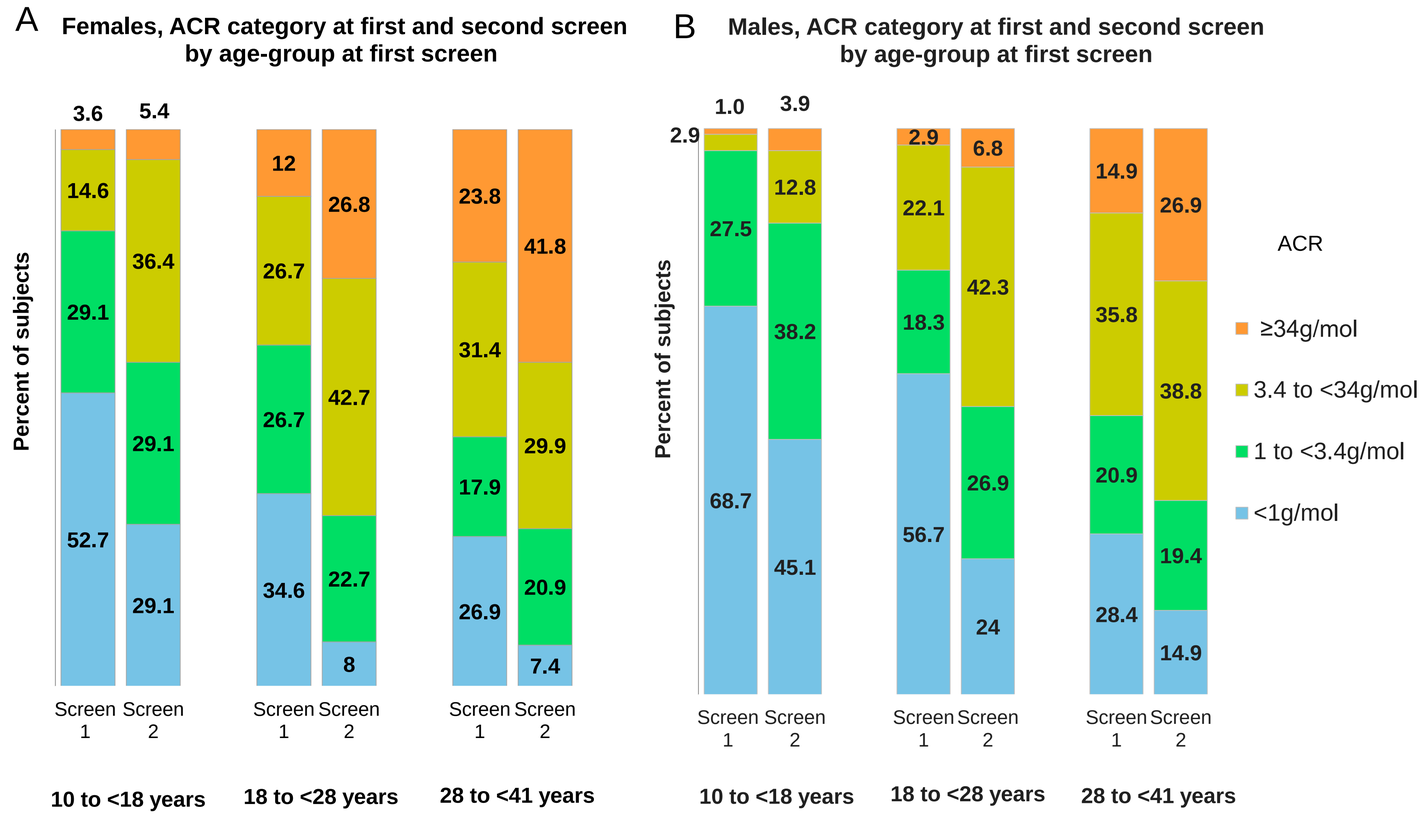
Conclusion

Earliest elevations of ACR, which frequently occur in children and adolescents, correlate with markers of nephron deficiency. Oligonephronia is probably a major initiator of progressive renal disease in this population. Higher rates of prevalent and incident albuminuria in females might flow from their inherently lower nephron endowment , now shown in several autopsy studies. Steady improvement in birthweights in this group promise some amelioration of this epidemic of renal disease.

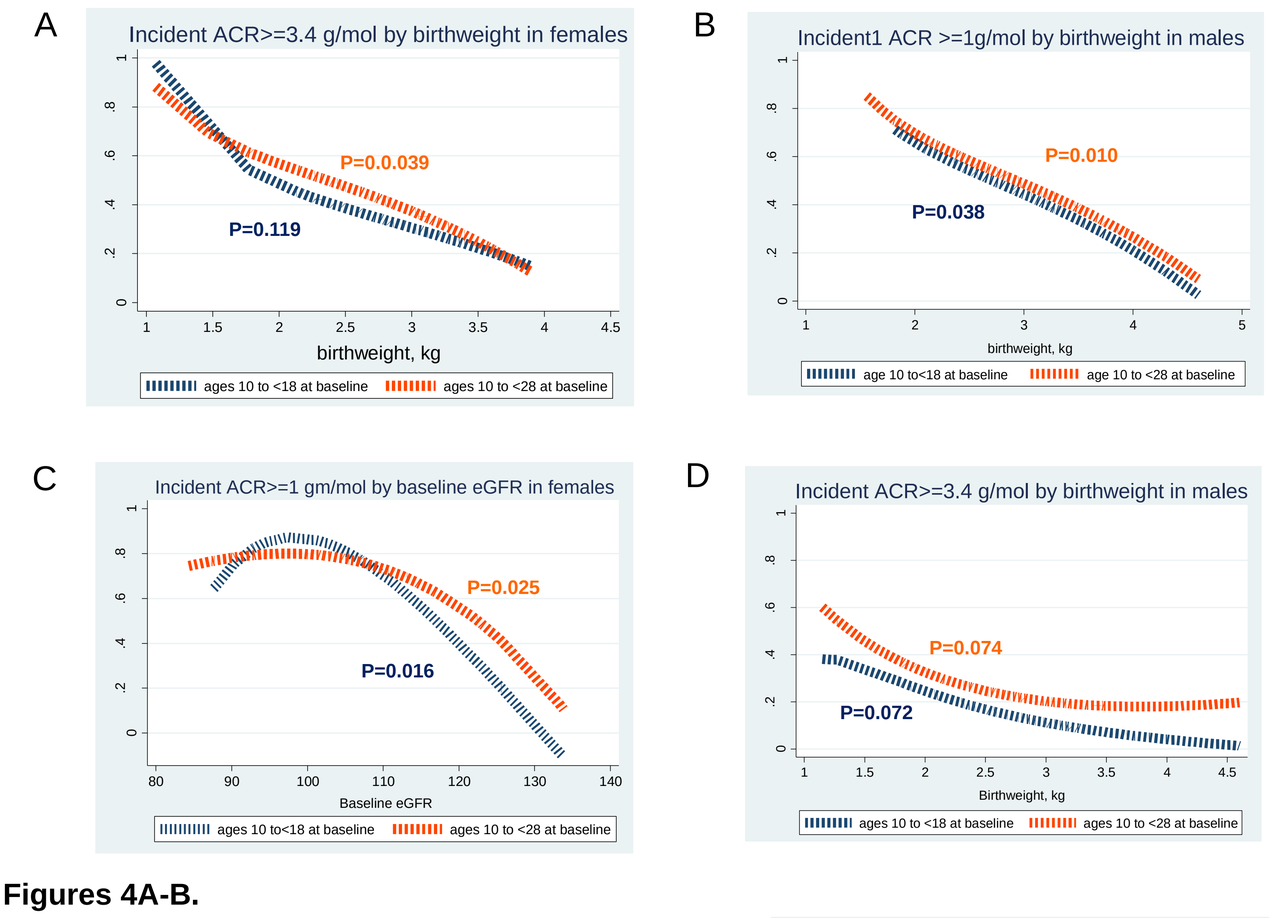
Figure 1.



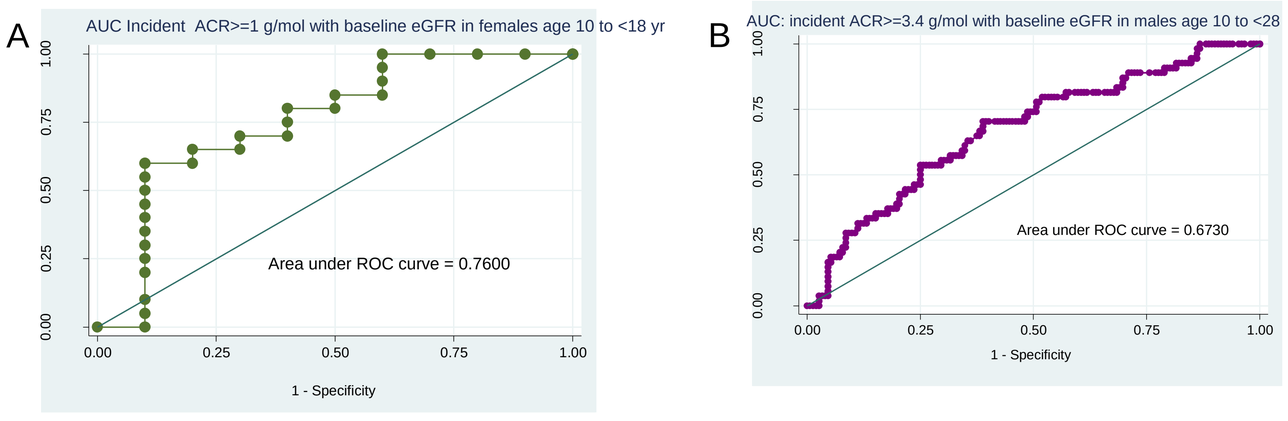
Figures 2A-B.



Figures 3 A-D.



Figures 4A-B.



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