**The challenge of nutritional management in people with kidney disease**

Simon Langley-Evans1\* and Nicola Thomas2.

1 School of Biosciences, University of Nottingham, Sutton Bonington Campus

Loughborough, LE12 5RD, United Kingdom

2 School of Health and Social Care, London South Bank University, 103 Borough Road, London, SE1 0AA, United Kingdom

\* Corresponding author: Simon.Langley-Evans@nottingham.ac.uk

**Dietary modification in kidney disease**

The impairment of metabolic functions associated with chronic kidney disease (CKD) requires dietary modification in order to prevent more rapid progression of disease and the development of co-morbidities such as hypertension. In the early stages of disease, dietary modification such as reduction of sodium intake, is usuallythe only treatment offered to patients, but as disease progresses, more major modifications become a critical adjunct to treatments such as haemodialysis. Dietary modifications in those with advanced kidney disease will extend to management of potassium and phosphorus intake and control over fluid balance for people requiring dialysis. Co-morbidities which increase renal injury and promote disease progression, primarily diabetes, will also require dietary management. The nutrition of people with kidney disease is therefore highly complex, necessitating high levels of patient engagement with clinical input.

**The challenge of a modified diet**

Dietary changes in CKD are generally not required for those who have stages 1-3 CKD. However, once stage 4 CKD is reached and referral to secondary care has been initiated, the changes to diet can be lifelong, maintained outside clinical settings and self-managed by the patient. In the initial stages of pre-dialysis care there will be one of a number of factors which appear overwhelming for the individual. The psychological and behavioural challenges that accompany dietary change will persist for extended periods, particularly as the diet might need to vary as the disease progresses. Integrating the renal diet into normal life is particularly challenging in situations outside the home, such as at work or in social situations [1], but also necessitates changes within the family. This can require education and increased awareness among other family members who prepare and cook food, and wider accommodation to a restricted diet among the whole family if a child has renal disease [2].

Information provided to patients is clearly critical in helping to adjust to and maintain new dietary patterns. Increasingly, the self-managing patient will utilize information available online. This is often of low quality, hard to understand and frequently inaccurate [3]. Dietitians therefore play a key role in educating patients on how to adhere to their therapeutic diet and, in addition to improving adherence with specific protocols [4], can help patients adapt to the challenges of lifestyle change [1].

**Requirements, intake and malnutrition**

Whilst patients who have advanced CKD are challenged by the need to change their established dietary habits, clinical management also poses problems. Due to poor appetite and metabolic disturbance, especially in end stage kidney disease (ESKD) [5], patients are at high risk of protein-energy malnutrition [6] and require close monitoring of nutritional status. As with all dietary assessment approaches, investigating adherence to renal-nutrition regimens is problematic and becomes more complicated where patients have poor understanding of their condition or low literacy [7]. Ensuring that energy requirements are met depends on suitable tools to estimate total energy expenditure, where approximating expenditure through physical activity is particularly challenging [8].

As the use of dietary assessment tools and application of formulae to estimate requirements can be imprecise, monitoring the patient who have kidney disease for protein-energy malnutrition is an essential element of clinical management, particularly at the point where haemodialysis is required. Malnutrition is strongly associated with greater mortality risk. A number of approaches may be taken to monitoring malnutrition in this patient group, ranging from as simple as following appetite [5] to using indices that encompass serum albumin, mid-upper arm muscle area, skinfold thicknesses, protein catabolic rate [6], inflammatory markers [9] and indices of muscle strength (pinch grip or hand grip) [10].

**Nutritional status and clinical outcomes**

Malnutrition in those undergoing haemodialysis arises partly due to the anorexia associated with poor health, but is also driven by the nutrient losses that occur during dialysis, the impact of high infection rates and metabolic changes that occur as a consequence of the treatment. Malnutrition significantly increases the risk of co-morbidities and mortality during treatment for ESKD. Simple measures such as body mass index are good predictors of this increased risk [11]. Patients are also at risk of other nutritional problems which are to some extent dependent on the nature of the dialysis treatment received. People with advanced CKD have disturbed calcium and phosphate status, which stems from insufficiency of serum 25-hydroxy vitamin D. Patients undergoing peritoneal dialysis are particularly prone to vitamin D deficiency, whilst haemodialysis can reduce this risk [12]. Anaemia is also an issue for patients with CKD and is one of the factors which impinges significantly on quality of life and cardiovascular complications. Managing iron status during dialysis has been shown to reduce inflammation, which will improve other clinical outcomes [13].

The nutritional management of people who have kidney disease is important to consider, especially in terms of slowing the rate of renal deterioration and controlling the development and progression of co-morbidities. The challenge is to find the balance between maintaining independence and a high quality of life in the early stages of disease and ensuring adequate monitoring and intervention to limit disease progression.

**References**

1. Morris A, Love H, van Aar Z, Liles C, Roskell C (2015). The problematic world of following a renal diet outside the home. *JORC* **41**, 253-259

2. Morris A, Love H, van Aar Z, Liles C, Roskell C (2017). Integrating renal nutrition guidelines into daily family life: a qualitative exploration. *J Human Nutr Dietetics* DOI: 10.1111/jhn.12483

3. Lambert K, Mullan J, Mansfield A, Koukomous A, Mesiti L (2017). Evaluation of the quality and health literacy demand of online renal diet information. *J Human Nutr Dietetics* DOI: 10.1111/jhn.12466

4. Rizk R, Karavetian M, Hiligsmann M, Evers SMAA (2017). Effect of stage-based education provided by dedicated dietitians on hyperphospataemic haemodialysis patients: results from the Nutrition Education for Management of Osteodystrophy randomised controlled trial. *J Human Nutr Dietetics* DOI: 10.1111/jhn.12472

5. Young V, Balaam S, Orazio L, *et al*., (2016). Appetite predicts intake and nutritional status in patients receiving peritoneal dialysis. *JORC* **42**, 123-131.

6. Nafzger S, Fleury L-A, Uehlinger DE, *et al*., (2015). Detection of malnutrition in patients undergoing maintenance haemodialysis: a quantitative data analysis on 12 parameters. *JORC* **41**, 168-176.

7. Duffrin C, Carraway-Stage VG, Briley A, Christiano C (2015). Validation of a dietary tool for African-American dialysis patients with low literacy. *JORC* **41**, 126-133

8. Sridharan S, Wong J, Vilar E, *et al*., Comparison of energy estimates in chronic kidney disease using doubly-labelled water. *J Human Nutr Dietetics* **29**, 59-66.

9. Ruperto M, Sanchez-Muniz FJ, Barril G (2016). Predictors of protein-energy wasting in haemodialysis patients: a cross-sectional study. *J Human Nutr Dietetics* **29**, 38-47.

10. El-Katab S, Omichi Y, Srivareerat M, *et al*. (2016). Pinch grip strength as an alternative assessment to hand grip strength for assessing muscle strength in patients with chronic kidney disease treated by haemodialysis: a prospective audit. *J Human Nutr Dietetics* **29,** 48-51.

11. Oliveira TS, Valente AT, Caetano CG, Garagarza CA (2017). Nutritional parameters as mortality predictors in haemodialysis: Differences between genders. *JORC* **43**, 83-91.

12. Hanna K, Fassett RG, Gill E, *et al*., (2015). Serum 25-hydroxy vitamin D concentrations are more deficient/insufficient in peritoneal than haemodialysis patients in a sunny climate. *J Human Nutr Dietetics* **28**, 209-218.

13. Thabet AF, Moeen SM, Labique MO, Saleh MA (2017). Could intradialytic nutrition improve refractory anaemia in patients undergoing haemodialysis. *JORC* DOI: 10.1111/jorc.12206