Adherence to Dietary Recommendations Measured by Smartphone-based Recipe Nutrition Calculator in Kidney Transplant Patients

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ABSTRACT

Background. Dietary restriction of protein, salt, and energy is recommended to prevent lifestyle related diseases, proteinuria, and graft dysfunction in kidney transplant patients. It is useful if the patients can evaluate meal components by themselves for each meal.

Patients and methods. A total of 26 maintenance-phase kidney transplant patients were included in the study. The mean age, sex, body mass index, number of years post-transplantation, creatinine clearance, and 24-hour urinary excretion (24 UE) of protein were recorded on a medical chart. Estimated daily protein and salt oral intake were calculated from 24 UE of nitrogen and sodium, respectively. We compared these laboratory results and patients' self-reported dietary intake using a smartphone-based recipe nutrition calculator (SRNC).

Results. Estimated daily protein and salt oral intake calculated from 24 UE of nitrogen and sodium were 55.4 ± 12.9 g/d and 8.5 ± 3.1 g/d, respectively. Estimated daily protein and salt oral intake measured by SRNC were 52.4 ± 13.8 g/day and 6.5 ± .9 g/day, respectively. The results of estimated daily protein and salt oral intake measured by SRNC were correlated to those calculated from 24 UE (R^2 = .287 and .217, respectively).

Conclusions. The results of estimated daily protein and salt oral intake measured by SRNC were correlated to those calculated from 24 UE in maintenance-phase kidney transplant patients. SRNC was useful as a measurement modality to evaluate the adherence to dietary guidance. Dietary therapy for these patients may have the potential to improve kidney graft function and survival.

DIETARY restriction of protein, salt, and energy is recommended to prevent lifestyle-related diseases, proteinuria, and graft dysfunction in kidney transplant patients. It is useful if patients can evaluate meal components by themselves for each meal. We investigated the current situation of adherence to dietary recommendations for chronic kidney disease using a smartphone-based recipe nutrition calculator (SRNC) in maintenance-phase kidney transplant patients.

PATIENTS AND METHODS

A total of 26 maintenance phase kidney transplant patients were included in the study. All patients had received nutritional guidance after kidney transplantation by certified hospital dietitian. Ten were female and 16 were male. The mean age, sex, body mass index, number of years post-transplantation, creatinine clearance, and 24-hour urinary excretion (24 UE) of protein were recorded on a medical chart. Estimated daily protein and oral salt intake were calculated from 24 UE of nitrogen and sodium, respectively. Briefly, estimated daily salt intake (in grams per day) was

This work was supported by the Osaka Study Group on Chronic Kidney Disease Diet Therapy, Osaka, Japan.

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0041-1345/19
https://doi.org/10.1016/j.transproceed.2019.03.021

Table 1. Patient Backgrounds

	N = 26
Age (years)	42.1 ± 9.1
Sex (male/female)	16/10
BMI (kg/m^2)	22.0 ± 3.3
Ccr (mL/min/1.73 m^2)	48.2 ± 17.1
No. of years post-transplantation (y)	13.8 ± 7.5
24 h urinary protein excretion (mg/d)	291 ± 338

Values are given as mean ± standard deviation unless otherwise indicated. Abbreviations: BMI, body mass index; Ccr, creatinine clearance.

calculated as 24 UE of sodium (mEq/d/17), and estimated daily protein intake (in grams per day) was calculated as ([24 UE of urea nitrogen (g/d) + .031 × body weight (kg)] × 6.25) [1]. We compared these laboratory results and patients' self-reported dietary intake using SRNC for chronic kidney disease patients.

RESULTS

The study included 26 patients (10 female patients, 16 male patients). The mean age, body mass index, creatinine clearance, number of years post-transplantation, and 24-hour urinary excretion of protein were 42.1 years, 22.0 kg/m^2, 48.2 mL/min/1.73 m^2, 13.8 years, and 291 mg/day, respectively (Table 1). Estimated daily protein and salt oral intake calculated from 24 UE of nitrogen and sodium were 55.4 ± 12.9 g/day and 8.5 ± 3.1 g/day. Estimated daily protein and salt oral intake measured by SRNC were 52.4 ± 13.8 g/day and 6.5 ± 1.9 g/day. The results of estimated daily protein and salt oral intake measured by SRNC were correlated to those which were calculated from 24 UE (R^2 = .287, 0.217, respectively) (Figs 1, 2).

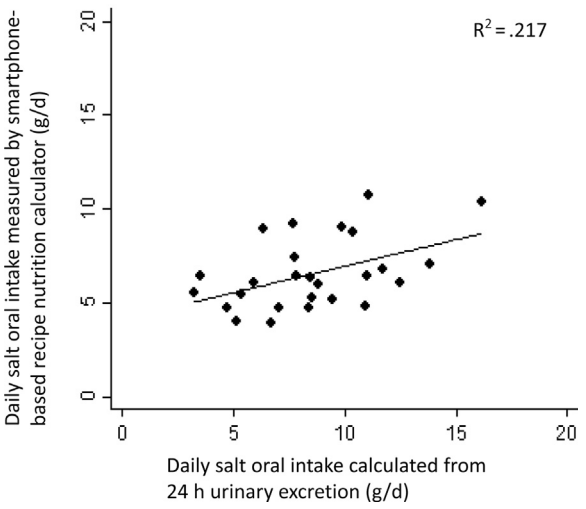

Fig 1. The results of estimated daily salt oral intake measured by a smartphone-based recipe nutrition calculator was correlated with those calculated from a patient's 24-hour urinary excretion (R^2 = .217).

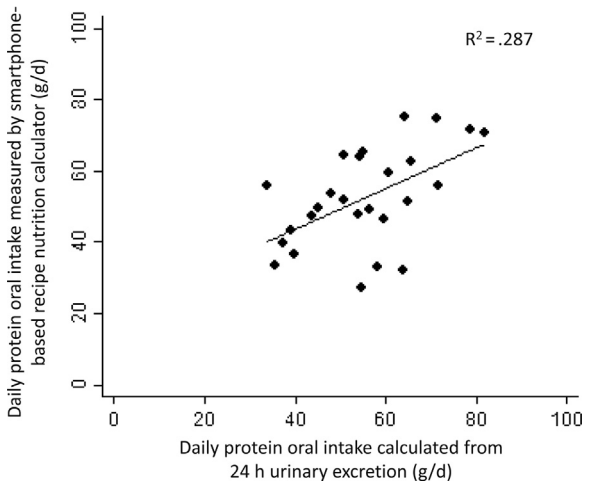

Fig 2. The results of estimated daily oral protein intake measured by an SRNC were correlated with those calculated from a patient's 24-hour urinary excretion (R^2 = .287).

DISCUSSION

Proteinuria and glomerular pathology relate independently to kidney graft survival, and even low levels of proteinuria relate to poor graft survival [2]. In hypertensive patients, reducing salt intake reduced blood pressure and urine protein excretion [3]. However, the adherence rate to dietary recommendations for chronic kidney disease in kidney transplant patients was low, and dietary therapy for these patients may have the potential to improve kidney graft function and survival [4]. Measuring sodium excretion in a 24-hour urine collection is the most reliable method of estimating salt intake, but it is not applicable to all patients. However, easier methods to estimate salt and protein daily oral intake are needed, because it is useful if the patients can evaluate meal components by themselves for each meal. In this study we estimated daily oral salt and protein intake using an SRNC, which can calculate and record dietary components when the user enters each meal. The results of estimated daily protein and salt oral intake measured by SRNC were correlated with those calculated from 24 UE. Dietary guidance using an SRNC may improve adherence to dietary recommendation to chronic kidney disease patients, because patients can check dietary components every day and are therefore more conscious of adherence to dietary guidance. The result of protein daily oral intake measured by the SRNC was almost the same level as that of the protein daily oral intake calculated from 24 UE, whereas the result of the daily oral salt intake measured by the SRNC was lower than that of daily oral salt intake calculated from 24 UE. Salt content in processed foods and seasoning may not be properly measured by the SRNC. The limitation of the study is its small number of patients and short follow-up periods. In addition to protein and salt, the SRNC can calculate energy, potassium,

phosphorus intake. The SRNC may be useful to prevent post-transplant obesity or diabetes, but further study is needed.

CONCLUSIONS

The results of estimated daily protein and salt oral intake measured by SRNC were correlated to those which were calculated from 24 UE in maintenance phase kidney transplant patients. SRNC is a useful measurement modality to evaluate adherence to dietary guidance. Dietary therapy for these patients may have the potential to improve kidney graft function and survival.

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