Actual intake vs. prescribed diet in a hemodialysis population: Comparison using a two-day dietary recall

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The National Kidney Foundation Dialysis Outcomes Quality Improvement Guidelines (K/DOQI) recommend that a thorough dietary interview be conducted with patients every six months (1). Renal dietitians recognize the importance of obtaining nutrition and dietary intake information from dialysis patients on a regular basis. Dietary intake information is typically obtained by conducting a 24-hour dietary recall or by the patient food record and documented for a specified length of time as described in K/DOQI. The use of food frequency questionnaires (FFQs) in this population has also been studied (2). Each method has inherent strengths and weaknesses. For example, with 24-hour recalls in the hemodialysis (HD) population, renal dietitians should obtain recalls from both dialysis and non-dialysis days. Studies have clearly shown a difference in intake between these two days (3). Typically, patients eat less on HD days for a variety of reasons. Appetite may be worse on these days and meals may be missed. Post-dialysis fatigue has also been found to interfere with dietary intake. There may also be unit specific eating restrictions during the HD session. A recent study looking at the usefulness of dietary recall in this population concluded that a seven day dietary record is necessary to reliably evaluate quantitative and qualitative aspects of food intake. This recommendation was attributed to the day to day variability in both the type and amount of food ingested, particularly from dialysis to nondialysis days (4).

This paper compares dietary recall findings obtained by two 24-hour dietary recalls to the prescribed diet for 55 CHD patients. This data was collected during the baseline period of a study related to oral nutritional supplementation in the chronic hemodialysis patient.

METHODS

Subjects

Patients undergoing chronic hemodialysis (CHD) at five outpatient dialysis units in Nashville, Tennessee and

Table 1: Patient Characteristics (n=55)

Age (y)	45.98 ± 12.99
Weight (kg)	82.40 ± 19.54
Height (cm)	166.73 ± 14.28

Female %	40
Male %	60

Race %	
Black	69
White	24
Asian	2
Hispanic	5

Diabetes by Race				
	Black	White	Asian	Hispanic
No	28	11	1	3
Yes	10	2	0	0

Diabetes by Gender		
	Female	Male
No	17	26
Yes	5	7

surrounding suburban areas were recruited to participate in a study related to oral nutritional supplementation. In order to participate in the study, subjects had to be ages 18 or older, receiving hemodialysis for at least 3 months with a minimum Kt/V of 1.2,have no active infections, inflammatory process, and no hospitalizations within the last month. Females of child-bearing potential were tested to ensure non-pregnancy status. The Institutional Review Board of Vanderbilt University Medical Center (VUMC) approved the study protocol, and written informed consent was obtained from all study patients.

Study Design

The study population consisted of 55 CHD patients. Study participants were asked to come to the General Clinical Research Center (GCRC) at VUMC on a non-dialysis day to perform study-related tests. Within 7 days of the body composition tests, baseline dietary intake was collected and fasting blood was drawn for laboratory testing.

Study Measurements

Dietary Prescription

Each subject's existing dietary prescription was obtained from his or her respective dialysis facility for comparison to the actual intake reported. Dietary prescriptions had been previously developed by each subject's respective renal dietitian. Since HD diet prescriptions do not differentiate between hemodialysis day (HDD) and non hemodialysis day (NHDD) prescriptions, the average intake of the HDD and NHDD intakes was used for analysis purposes. The dietary variables included energy, protein, sodium, phosphorus and potassium. Although fluid restriction was part of the diet prescription, there was not an emphasis on collecting non-caloric fluid consumption data. Therefore, total fluid consumption data was not included for analysis.

Dietary Intake

Participants were interviewed by a trained registered dietitian for two 24-hour diet recalls (one from a HDD; one from a NHDD) which were obtained separately the day after each 24-hour period. All dietary intake data was collected and analyzed using the Nutrition Data System for Research (NDS-R) software version 5.0, developed by the Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN (5). To ensure as much accuracy as possible, the multiple-pass system was used when obtaining the 24-hour diet recalls (6). This multiple pass is intended to provide the participant with signals and opportunities to report their intake. The three passes in this study included a quick list, a detailed description, and a final review of intake to allow participants the opportunity to report their diet recalls as accurately as possible.

Statistical Analysis

Data are presented as mean with standard deviations (SD) of the group. When examining differences between

Table 2: Prescribed vs. Actual Diet Intake

	Diet Prescription	Actual Diet Intake
Total Energy		
(kcal/day)	2383.3 ± 307.2	1564 ± 498.8
Protein*		
(gm/day)	***89.3 ± 14.3***	***60.2 ± 16.5***
%	15	16
Carbohydrate		
(gm/day)	328.0 ± 59.3	189.6 ± 77.8
%	55	47
Fat*		
(gm/day)	79.4 ± 13.2	64.7 ± 24.4
%	***30***	***37***
Sodium (mg/day)	2963.6 ± 188.9	2870.8 ± 1080.9
Phosphorus (mg/day)	1121.0 ± 180.9	829.8 ± 266.9
Potassium (mg/day)	2824.4 ± 302.4	1537.9 ± 516.0

* Protein (gm/day) and Fat (%) were found to be statistically significant with a two-tailed p value of less than 0.05.

actual versus prescribed diets, a student's t-test for parametric distribution or Mann-Whitney U test for nonparametric distribution were used to determine differences between the means. Statistical significance was established when a two-tailed *p* value was less than 0.05. The software SPSS (SPSS Inc, Chicago, IL) version 14 was used for all analyses.

RESULTS

Subject Characteristics

Of the 55 subjects in the study, 60% of them were male, 69% were Black, 24% were White, 2% were Asian and 5% were Hispanic. Weights and heights were measured during the baseline study visit at the GCRC with a mean weight of 82.4 kg and a mean height of 166.7 cm. Other subject characteristics including diabetes status by race and gender can be found in Table 1.

Nutritional Intake vs. Diet Prescription

Table 2 shows comparisons between the diet prescription and actual dietary intake in terms of daily energy (kcals/day). These results are 2383 kcals/day versus 1564 (19.5 kcal/kg/day) respectively. The prescribed protein intake of 89.3 gm/day versus an actual protein intake of 60.2 gm/day (0.73 gm/kg/day) is also shown. Other macronutrients (in grams of carbohydrate and fat) and the micronutrients (in milligrams of sodium, phosphorus and potassium) are also summarized in this table.

DISCUSSION

As seen in Table 2, actual reported dietary intake was less than prescribed for all parameters evaluated: energy, protein, carbohydrate, fat, sodium, phosphorus and potassium. However, actual percent of fat intake (37%) was higher than the dietary prescription of calories from fat (30%), which was statistically significant. This high fat percentage may be in part due to the convenience-type foods the participants chose, especially on HDD. While the actual food choices of the diets are not the focus of this paper, it was observed that many dietary recalls included meals from fast food restaurants and convenience stores.

The data related to actual grams of protein consumed (60.2 gm/day) vs. prescribed (89.3 gm/day) was also statistically significant. Again, the type and quality of the foods chosen may be a factor and this deserves further evaluation on its own. Despite having all recalls done by one trained individual and the use of the multiple pass system to capture more complete recalls, it is likely under-reporting may have occurred. It is well understood that dietary intake is underreported, not just in the dialysis population but in the general population as well where underreporting estimates range from 10 – 45% (7).

Previous studies have shown that calorie and protein intake is low for CHD patients, especially on the HDD (2, 3, 4, 8, 10). A review of these findings is summarized in Table 3. Each of these studies investigated a unique question, and their methods of collecting dietary information varied as summarized. However, the results of this dietary intake data is similar in that all subjects fell short of their prescribed calorie consumption goals and only two subject groups met their prescribed protein intake. Guidelines recommend 30 to 35 kcal/kg/day and 1.2 gm protein/kg/day for the CHD population (1). As shown in Table 3, energy consumption ranged from 20.7 to 29.8 kcal/kg/day and protein consumption ranged from 0.88 to 1.20 gm protein/kg/day. Our own study results included energy consumption of only 19.5 kcal/kg/day and protein intake of 0.73 gm/kg/day. Many reasons have been proposed regarding low energy and protein intake in CHD patients. These include:

1. Restrictions imposed by the diet
2. Co-morbid conditions that also may impact appetite and/or food choices
3. Time and energy expended to attend thrice weekly dialysis sessions
4. Eating limitations imposed by some facilities during the actual dialysis procedure
5. Lack of physical and/or financial support regarding shopping and food preparation
6. Lack of appetite especially on the HDD
7. Dietary monotony (10)

CONCLUSION

Despite advances made in dialysis therapies and

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Table 3: Calorie and Protein Intake Summary of Hemodialysis Patients

Author & Reference No.	Population	Diet Evaluation Tool	Calorie Consumption (kcal/kg/day)	Protein Consumption gm/kg/day)	Specific Findings/Comments
Kalantar-Zedah (2)	30 adult HD pts at one dialysis unit; 30 matched controls	FFQ-Block version 98	26.4 ± 15.3	0.88 ± 0.57	• HD pt. diets were low in calcium, fiber, potassium and two carotenoid vitamins • Vitamin B6 was high due to MVI used
Burrowes (3)	1901 HD pts in 72 HD units associated with 15 clinical centers	Two-day diet records kept; HDD vs. NHDD	23.2 ± 9.5 NHDD 22.2 ± 9.6 HDD	0.96 ± 0.43 NHDD 0.90 ± 0.41 HDD	• Appetite better on NHDD vs. HDD • Only 48% ate 3-5 meals on HDD vs. 64% on NHDD • Help with shopping allowed greater energy & protein intake both days
Chauveau (4)	99 HD pts at two HD units and one HD self care unit	7-day dietary record	29.8 ± 7.5	1.18 ± 0.28	• HD intake lower than the general French population • Intake lower in the older group • Differences in type & amount of food found, especially HDD vs. NHDD • A 7-day food record is recommended to reliably evaluate food intake
Morais (8)	44 HD pts	Dietary recall	20.7 ± 6.7	1.20 ± 0.6	• Total energy intake was low but protein intake was acceptable
Zimmerer (10)	48 HD pts at eight free-standing dialysis unit	FFQ-Block National Cancer Institute Questionnaire plus 10 additional foods	24.8 ± 12.7	1.02 ± 0.53	• The most varied diets had a greater energy and protein intake: (33 cals/kg/day & 1.35 gm/kg/day) • Monotonous diets had a lower intake of: • (21 cal/kg/day & 0.83 gm/kg/day)

collaborative efforts from of the nephrology care team, the oral intakes of hemodialysis patients are rarely met. Obtaining dietary intake information continues to be an important tool for the renal dietitian to use in order to assist in the evaluation of their patients' nutrition status. However, our study findings as well as the other studies summarized in Table 3 indicate that a one or two day recall may not provide enough information for an accurate evaluation. Recent studies have shown that it may be necessary to obtain dietary information for a five to seven day period (4,11). The additional length of time may be necessary to obtain a more reliable account of day to day variability. In addition, it may be a more accurate reflection of usual food intake. Further detailed studies are indicated in the area of dietary recalls, dietary records and food frequency questionnaires (FFQ) to determine the best method and the necessary reporting length to obtain the most accurate and reliable dietary intake information in the CHD population. It is imperative to obtain reliable information in order to have a positive impact on improving patient caloric and protein intakes.

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