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Original Article

Dietary self-efficacy: determinant of compliance behaviours and biochemical outcomes in haemodialysis patients

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Abstract

Background. Despite the diversity of proposed theories, researchers are still unable to fully explain dietary compliance behaviours of dialysis patients. Dietary self-efficacy, a concept less studied in dialysis, has been linked to positive compliance outcomes in the chronic illness literature. Therefore, the aim of the present research was to determine how dietary self-efficacy is related to selected biochemical markers and self-reported behavioural outcomes in haemodialysis patients.

Methods. 107 subjects participated in a cross-sectional study. Four questionnaires assessed dietary self-efficacy, compliance attitudes and behaviours, and staff–patient relationships. Laboratory outcomes were retrospectively obtained from patients' medical records and averaged for the previous 6 months.

Results. Of the behavioural measures, only dietary self-efficacy was associated with laboratory outcomes. Dietary self-efficacy was also positively related to staff–patient relationships and to patients' self-reported assessment of compliance behaviours. Women had greater dietary self-efficacy than men. The number of family members living with the respondent was inversely related to dietary self-efficacy.

Conclusions. Results indicated that dietary self-efficacy determined both behaviours and laboratory outcomes. Patients with greater dietary self-efficacy had lower serum potassium and weight gain, showed favourable compliance attitudes and behaviours toward prescribed regimens and fostered better relationships with staff. Based on these findings we recommend an experimental approach to clarify whether maximizing dietary self-efficacy efforts is without psychological burden to patients and whether the positive effect of increased

dietary self-efficacy is maintained in long-term dialysis patients.

Keywords: compliance behaviours; dietary self-efficacy; haemodialysis; health outcomes; patient–staff relationships

Introduction

Patients' compliance behaviours concerning therapy and prescriptions have been extensively studied. However, Kaveh and Kimmel [1] stated that despite past efforts, no universal theory has been developed that satisfactorily describes dialysis compliance behaviours. The need for such a theory is, however, pressing so that we can develop more successful interventions to improve therapeutic compliance in this population [2–5].

Among the several cognitive–behavioural variables identified, few proved to successfully explain compliance behaviours in dialysis patients [1,3,5,6]. Social learning theory (self-efficacy), an emerging concept proposed to explain behaviours, has been shown to positively affect health outcomes and to improve compliance in different chronic patient groups including renal patients [6–11].

According to Bandura [7], self-efficacy is mediated by a person's beliefs or expectations about his/her capacity to accomplish certain tasks successfully or demonstrate certain behaviours. Bandura postulates that these expectations determine whether or not a certain behaviour or performance will be attempted, the amount of effort the individual will contribute to the behaviour, and how long the behaviour will be sustained when obstacles are encountered.

Research to test whether manipulating self-efficacy beliefs and expectations modifies dietary outcomes has shown promise [12–16]. However, unlike fluid

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management self-efficacy [8,10,17], dietary self-efficacy has not been thoroughly investigated in haemodialysis patients. Therefore, our aim in the present research was to determine how dietary self-efficacy is related to selected care characteristics measured as biochemical indices as well as to self-reported dietary behaviours in haemodialysis patients.

Subjects and methods

The study was implemented with a cross-sectional design. Subjects were selected from a pool of approximately 1700 patients in 20 dialysis centres. The eligible number of subjects, applying the inclusion criteria explained below, was 1228. For ease of administration (the current research considers a pilot study of a larger follow-up), we aimed to sample 10% of the eligible population. Therefore, a convenience quota sampling of six subjects per each centre was employed. Thirteen patients declined; our final sample consisted of 107 participants. Selection criteria included the following: (i) the patient attends chronic haemodialysis treatment (haemodialysis and haemodiafiltration) for a minimum of 3 months prior to the study; (ii) the patient is prescribed a minimum of 3 h treatment modality three times a week; (iii) treatment is provided by polysulfone dialysers with a maintained blood flow of at least 250 ml/min; the patient is at least 18 years of age; the patient suffers no major mental or psychological disorders and communicates in Hungarian. The institutional ethical board approved the research. Signed individual consents from all patients were obtained who participated in the study.

Main clinical outcomes, such as serum potassium, serum phosphorus, serum albumin and interdialytic weight gain (SeK, SePO₄, SeAlb and IWG) as well as treatment conditions and medical history were retrospectively assessed from patients' medical records. These indicators were selected because they have been reported as proxy clinical measures of patients' dietary behaviours [1].

Self-reported assessments required patients to reflect on their dietary efforts of the past month. Our goal was to match these self-assessments with laboratory data obtained from the previous month. However, the number of laboratory measurement points of a single month did not provide enough variance for meaningful analysis of behaviours. To increase variance, we decided to average the above four clinical outcomes for the past 6 months preceding the study.

A clinically trained psychologist assessed individual behaviours and attitudes through patient interviews. Subjects were asked to respond to four questionnaires and to questions on a demographic sheet. Completing all instruments took 45–50 min on average per each patient. The Situational Dieting Self-Efficacy Scale (SDS) assessed dietary self-efficacy [16]. This scale comprised 25 statements about various eating situations combined with personal moods. Respondents are asked to indicate on a scale of 0–100% their ability to resist a particular eating challenge. Patient Reactions Assessment (PRA) measured staff–patient relationships [18]. The instrument included 15 Likert-type statements (1 = strongly disagree, 5 = strongly agree) on the following three dimensions of staff–patient interactions: provision of information, caring and personal communication. We used the Renal Adherence Attitudes Questionnaire

(RAAQ) and the Renal Adherence Behaviour Questionnaire (RABQ) to report patient behaviours and attitudes [19]. The RAAQ is a 26-item scale measuring general attitudes toward compliance. The scale is composed of Likert-type statements, which measure a patient's attitudes toward social restrictions, well being, self-care/support and acceptance. The RABQ consisted of a 25-item scale measuring self-reported dietary (diet and fluid) compliance. Specific dimensions on the scale were: compliance to fluid restrictions; compliance regarding potassium and phosphate restrictions, compliance regarding self-care; compliance regarding sodium intake; and compliance in times of particular difficulty.

Higher scores indicated better outcomes on each instrument. All instruments had pre-established validity and have shown sufficient reliability in earlier use.

For ease of administration, we modified scoring on the SDS by transforming responses to a 0–10 scale. Due to culturally unsuitable statements, the number of items was also reduced to 15 on the SDS. Validity and reliability (expressed as Cronbach's alpha) for the SDS was still preserved (0.92). For the remaining instruments, reliability ranged between 0.84 and 0.92.

Descriptive statistics were used to describe sample characteristics. To obtain measures of association, we calculated Pearson correlation coefficients and partial correlation coefficients. Independent sample *t*-tests and analysis of variance were done to detect group differences. A hierarchical regression approach was employed to assess individual contributions of factors to patient reported compliance behaviours. Statistical significance was set at 5%. We analysed data with SPSS Windows version 8.0.

Results

Sample characteristics are presented in Table 1. The average age of the sample was 57.6 (SD 14.03) years. Patients have been diagnosed with kidney disease for 10.4 (SD 9.15) years on average and have been on haemodialysis treatment for an average of 50.4 (SD 25.66) months. Our sample was gender and residence balanced. The majority of the respondents lived with a spouse, were unemployed and completed less than high school education. Hypertension was dominant and ischaemic heart disease was prevalent in our sample.

Of the self-reported patient measures, only dietary self-efficacy was associated with two of the biochemical indices. These relationships remained unaffected even when social, behavioural and treatment variables had been controlled for. The greater dietary self-efficacy was, the lower serum potassium ($r = -0.22$; $P < 0.001$) and weight gain ($r = -0.35$; $P < 0.001$) had been. No other behavioural measures correlated with any further biochemical outcomes.

Dietary self-efficacy was also positively related to staff–patient relationships ($r = 0.34$; $P < 0.05$) and to patients' self-reported compliance attitudes ($r = 0.21$; $P < 0.05$) and behaviours ($r = 0.24$; $P < 0.05$). Better staff–patient relationships indicated greater dietary self-efficacy. Greater dietary self-efficacy also resulted in improved compliance attitudes and behaviours.

Table 1. Sample characteristics

	Mean	SD	%
Age	57.6	14.03	
Gender (female/male)			50.5/49.5
Spouse (yes/no)			89.7/10.3
Family members living together	2.6	1.14	
Education (> high school/< high school)			71/29
Employment (yes/no)			6.5/93.5
Residence (urban/rural)			52.3/47.7
Dry weight (kg)	65.9	15.66	
Interdialytic weight gain (kg/48 h)	2.89	1.18	
Diagnosis of kidney diseases (years)	10.4	9.15	
Residual urinary volume (ml)	603.9	760.65	
Duration of dialysis (months)	50.4	25.66	
Length of treatment (h/week)	10.25	1.62	
Serum albumin (g/l)	38.2	3.57	
Serum potassium (mmol/l)	5.33	0.6	
Serum phosphorus (mmol/l)	1.86	0.4	
AMI (myocardial infarct) (yes/no)			13.1/86.9
Stroke (yes/no)			15/85
Hypertension (yes/no)			93.5/6.5
Ischaemic heart disease (yes/no)			50.4/49.6
Diabetes (yes/no)			29/71
SDS (scores)	110	31.4	
PRA (scores)	78.5	7.53	
RAAQ (scores)	52.2	8.63	
RABQ (scores)	73.3	6.04	

SD, standard deviation; SDS, Situational Dieting Self-Efficacy Scale; PRA, Patient Reactions Assessment; RAAQ, Renal Adherence Attitudes Questionnaire; RABQ, Renal Adherence Behaviours Questionnaire.

Dietary self-efficacy was positively linked to the age of the respondent ($r=0.22$; $P=0.25$); older people exhibited more efficacy. The relationship between dietary self-efficacy and duration of care (in months), however, was not significant. Nor was dietary self-efficacy related to the number of years since the diagnosis of the kidney disease.

We found no difference in dietary self-efficacy with regards to education or employment of subjects ($F=0.96$; $P=0.44$ and $t=1.69$; $P=0.09$). However, significant gender differences were revealed ($t=-2.82$; $P=0.006$); women had greater dietary self-efficacy than men.

Residual urinary output, despite expectations, did not affect dietary self-efficacy. Dietary self-efficacy was also unaffected by the severity of the patients' physical condition.

Of the social characteristics, living with or without a spouse did not influence dietary self-efficacy ($t=-1.28$; $P=0.22$). However, the number of family members living with the respondent was inversely related to dietary self-efficacy ($r=-0.11$; $P=0.049$); suggesting that the increase in the number of family members resulted in lower dietary efficacy beliefs and expectations for patients.

To assess the individual contribution of selected variables predicting patients' compliance behaviours, a hierarchical regression analysis was run. We entered demographic (age, gender), disease specific (time since diagnosis of disease and since first treatment, hours of treatment/week), therapeutic (IWG, SeK, SePO₄, SeAlb, residual urinary output) and behavioural

(dietary self-efficacy, patient-staff interactions and attitudes toward therapy) factors in consecutive steps. Results of the last hierarchical step are presented in Table 2.

The final model accounted for 25% of the variance in patient reported compliance behaviours ($R^2=0.25$; $F=4.925$, $P=0.035$). The most significant contribution to the model was attributed to residual urinary output (increased explained variance by 12.7%), followed by dietary self-efficacy, patient attitudes toward therapy and serum albumin. Demographic or any other therapeutic factors reached no further significance in the model.

Examining significant *b* weights informs about the unit improvement in patient reported behaviours by each factor. For example, an increase of 100 ml in residual urinary output decreases the self-reported compliance behavioural score with 12.2 points. That is, the more urinary output a patient has, the less compliant with therapy prescriptions the individual will be. Similarly, a 10-point improvement in dietary self-efficacy increased self-reported compliance behaviour scores with 20.25 points. In other words, increased beliefs and expectations to be able to resist tempting eating situations result in better patient compliance with care.

Discussion

The aim of the current research was to explore how dietary self-efficacy influenced biochemical treatment

Table 2. Hierarchical regression model, step 4^a

	<i>b</i> weights	Beta	<i>P</i>
Constant	37.73		0.012
Age	-0.056	0.137	0.259
Gender	-1.268	-0.106	0.319
Time since diagnosis	0.034	0.047	0.681
Time since first treatment	-0.012	-0.107	0.404
Hours per week on treatment	0.433	0.123	0.273
Residual urinary output	-0.122	-0.363	< 0.001
Interdialytic weight gain	0.009	0.197	0.166
Serum potassium	-0.046	-0.004	0.974
Serum albumin	0.632	0.102	0.003
Serum phosphorus	-0.285	-0.019	0.867
Dietary self-efficacy (SDS)	2.025	0.157	< 0.001
Patient-provider relationship (PRA)	0.099	0.125	0.396
Patient attitudes toward therapy (RAAQ)	1.27	0.108	0.02

^aNote: dependent variable = patient self-reported compliance behaviours (RABQ).

markers and compliance behaviours of haemodialysis patients. Results confirmed several relationships between dietary self-efficacy and care and patient characteristics. Patients with increased dietary self-efficacy had lower serum potassium and weight gain, showed more favourable compliance attitudes and behaviours toward prescribed regimens and fostered better relationships with staff.

To our present knowledge, the current study is among the few that have established a direct relationship between a specific dietary self-efficacy measure and biochemical outcomes of dialysis care. Whether the relationships between dietary efficacy and serum potassium and weight gain may be translated into effective interventions designed to enhance patient compliance will be determined by future research.

Dietary self-efficacy capabilities were more linked to the age of the respondent than to time since diagnosis of kidney disease or duration of therapy. However, expectation was that the longer the patient had been affected by the dietary adjustment, the greater his/her dietary self-efficacy should have been. Especially, duration of therapy should have been more associated with dietary self-efficacy. According to Bandura [7], longer exposure time to the eating regulation problem allows patients better master dietary efficacy experiences. Why this was not true in our study requires further investigation.

As for social variables, the only significant difference in dietary self-efficacy was found for women. Still, this difference did not translate into better or improved health outcomes for women in this research. How gender differences in dietary self-efficacy may benefit patients concerning health outcomes remains a question for longitudinal research.

Our results also confirmed the indirect effects of staff interactions with patients on compliance attitudes and behaviours as well as on laboratory outcomes. Positive patient-staff relationships increased self-reported compliance efforts and behaviours of patients and enhanced dietary self-efficacy capacities. Therefore, it appears that through better relationships with their clients staff

can influence potassium intake and weight gain in patients.

Similar results emerged for patients' employment status. Employment had no direct effect on dietary self-efficacy; however, those with a job had better relations with staff, which increased dietary self-efficacy and lowered serum potassium and extra weight.

The effect of social pressure on patients' eating habits was also present in our sample. As the number of family members living with the patient increased so did the patient's expectation of his/her ability to resist tempting eating situations decrease. This relationship was reflected in therapeutic outcomes as well; patients with more family members had increased serum phosphorus levels and more weight gain.

Results from the regression analysis confirmed the positive effect of dietary self-efficacy on patient reported compliance behaviours. Given that a patient scored zero on the self-reported patient compliance measure (no compliance behaviours at all), we estimated that an approximately 60-point increase in dietary self-efficacy could result in full patient compliance behaviours. [Self-reported patient compliance was measured on a 25-item scale with a rating between 1 and 5 for each item. The maximum possible score was 125 (full compliance). As an increase of 1-point in dietary self-efficacy results in a 2.025-point improvement in the final patient compliance behaviour score, increasing dietary self-efficacy with 62 points yields a final patient compliance score of 125.55.] These results support that designing clinical interventions to modify dietary efficacy beliefs and expectations can yield significant and prolonged improvements in patients' compliance behaviours. Whether such interventions are feasible and meaningful for the patients should be determined by future research.

Evidence to promote the positive influence of increased serum albumin on patient survival exists [1]. We also noted a positive relationship between serum albumin and self-reported patient compliance behaviours in our regression analysis. We suspect that increased serum albumin may have a beneficial effect

on compliance behaviours, which translates into better survival of patients. However, from the available data we were not able to support such a direct link.

Based on findings from the current research we recommend an experimental approach to identify methods of interventions that increase dietary self-efficacy in haemodialysis patients. We also recommend further study of the relationships between dietary self-efficacy and patient compliance behaviours and survival on haemodialysis care.

The authors acknowledge that results of this study may be a function of the sample selection. Therefore, generalizability is cautioned and should be limited to centres utilizing identical care protocols.

This study employed only a selected set of cognitive-behavioural measures and accounted for some of the technical aspects of care. Introducing additional measures may have produced alternative outcomes. Statistical power, due to a smaller number of subjects, may have reduced the potential to identify significant relationships in some analyses.

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Conflict of interest statement. None declared.

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