



Psychometric evaluation of the short version of the Personal Diabetes Questionnaire to assess dietary behaviors and exercise in patients with type 2 diabetes



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ARTICLE INFO

Keywords:

Diabetes management
Eating behaviors
Assessment
Reliability
Validity

ABSTRACT

Background: Patients with diabetes and of lower socioeconomic status have difficulty adhering to dietary recommendations. Practical and effective tools assessing self-management behaviors are needed to help evaluate interventions tailored to the needs of individual patients or population groups. This study examined the psychometric properties of a short 11-item version of the Personal Diabetes Questionnaire scale (PDQ-11) using data from the Public-Private Partnership to Improve Diabetes Education trial.

Methods: Patients (n = 411) with type 2 diabetes from ten safety net primary care clinics in the Mid-Cumberland Region of Tennessee completed the PDQ-11, the Summary of Diabetes Self-Care Activities (SDSCA), the Perceived Diabetes Self-Management Scale (PDSMS), and the Adherence to Refills and Medications Scale (ARMS). Statistical analyses were conducted to explore the subscale structure of the PDQ-11, and the internal consistency and validity of its subscales.

Results: Exploratory factor analysis of the PDQ-11 revealed four components (Cronbach's $\alpha = 0.50$ to 0.81): Eating Behavior Problems; Use of Information for Dietary Decision Making; Calorie Restriction; and Activity and Exercise. Eating Behavior Problems and Use of Information for Dietary Decision Making had the strongest associations with the diet subscales of the SDSCA and were also correlated with the PDSMS and the ARMS scores (all $ps < 0.001$). Different PDQ-11 subscales were correlated with BMI (Calorie Restriction Activity and Exercise) and blood pressure (Eating Behavior Problems).

Conclusions: The PDQ-11 is a useful measure of dietary behaviors in patients with type 2 diabetes; its use may help providers tailor individual nutrition intervention strategies to patients.

1. Introduction

Lifestyle intervention that involves detailed menu plans, counting of calories and control of portion sizes is an effective component of a diabetes treatment plan (Andrews, Cooper, Montgomery, et al., 2011; LoPi-Sunyer, Blackburn, Brancati, et al., 2007; Wadden, West, Delahanty, et al., 2006). Yet, many patients with diabetes have difficulty adopting and/or adhering to these dietary behaviors. In its recent position statement, the American Diabetes Association not only identified nutrition therapy as an integral part of diabetes management, but also recognized the need for healthcare providers' support in implementing nutrition therapy, particularly for patients with health literacy and numeracy challenges (Evert, Boucher, Cypress, et al.,

2014). For this segment of the population, patient-centered care would be particularly beneficial in identifying dietary self-care barriers (The National Diabetes Education Program (NDEP), n.d.; Huizinga, Carlisle, Cavanaugh, et al., 2009; Rothman, Housam, Weiss, et al., 2006), to enable care to be tailored to individual patient's characteristics and needs (Akohoue, Patel, Adkerson, & Rothman, 2015).

24-hour dietary recall, food diary, and food frequency questionnaires are commonly used to assess eating behaviors (Thompson & Byers, 1994). However, they present significant challenges for both clinicians and researchers. These assessment tools can be costly, labor-intensive, and time-consuming. In addition, they rely on patient's recall, require a literate population, and multiple records over several months to capture habitual intake (Thompson & Byers, 1994).

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<http://dx.doi.org/10.1016/j.eatbeh.2017.04.002>

Received 24 October 2016; Received in revised form 31 March 2017; Accepted 3 April 2017

Available online 06 April 2017

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Few diabetes-specific instruments, with established psychometric properties, have also been used to assess eating behaviors in patients with diabetes (Greco, La Greca, Ireland, et al., 1990; Schmitt, Gahr, Hermanns, et al., 2013; Toobert & Glasgow, 1995). However, they are limited in the dietary information they provide. For example, the diet-related component of The Diabetes Self-Management questionnaire (Schmitt et al., 2013) assesses *the extent to which patients' food choices help achieve glycemic control, patients occasionally eat high carbohydrates rich foods, and the degree to which they strictly follow dietary recommendations from their healthcare providers*. In The Self-Care-Inventory (Greco et al., 1990), the diet-related component evaluates patients' perceptions of how well they engage in *eating the proper foods, sticking to meal plan, eating meals on time, and eating regular snacks*. The Summary of Diabetes Self-Care Activities (SDSCA) (Toobert & Glasgow, 1995) is the most widely used such instrument among the few diabetes-specific instruments available to assess eating behaviors. It measures patients' self-care activities in six domains, including diet and exercise, in the previous week. Although the SDSCA has been validated in a number of settings (Amoako, Skelly, & Rossen, 2008; Utz, Williams, Jones, et al., 2008; Vincent, McEwen, & Pasvogel, 2008), the information it provides focuses only on the number of days a healthy meal plan was followed or fatty foods were consumed, thus limiting one's understanding of the respondent's eating behavior and the ability to identify unhealthful dietary practices or challenges so the specific areas can be targeted for improvement.

Most dietary decisions related to diabetes self-management are performed by the individual with the disease, and one main concern is how to efficiently gain insight into patients' eating practices so that barriers can be identified and addressed. Unlike the SDSCA, the Personal Diabetes Questionnaire facilitates the collection of such data (Stetson, Schlundt, Rothschild, et al., 2011). The original Personal Diabetes Questionnaire, consisting of 68 items, was developed to measure diabetes self-care behaviors (diet, medication adherence, blood glucose monitoring, and exercise) and related perceived barriers. It has a 6th grade reading level, and results from a preliminary evaluation of the original scale suggested that it is a reliable and practical tool for assessing diabetes self-care behaviors, including dietary practices (Stetson et al., 2011). The diet domain of the original scale also measures various aspects influencing eating behaviors including diet knowledge, dietary decision making, and individual perceptions, which could not be assessed with the diet subscales of the SDSCA. Such subscales are needed to identify specific areas of challenges experienced by patients with diabetes, particularly those with low socioeconomic status and numeracy skills. Although the original version of the Personal Diabetes Questionnaire is a comprehensive instrument, its length makes it burdensome to administer in clinical settings. In addition, earlier evaluation of the original scale, which involved a large cohort of patients with diabetes ($n = 783$), targeted primarily non-Hispanic White (96%), and only 15% reported having less than a high school education (Stetson et al., 2011). In contrast, in the current study, almost half of participants were from minority groups, and most of them were from families with lower socioeconomic status. The purpose of this study was to assess the psychometric properties of a short version of the Personal Diabetes Questionnaire (the PDQ-11) among low-income patients with type 2 diabetes.

2. Materials and methods

2.1. Research design

A cross-sectional analysis was conducted using data from baseline enrollment into a clustered randomized trial comparing an enhanced educational intervention focused on addressing health communication and health literacy with a standard educational intervention comparison group based on the National Diabetes Education Program. The

study, known as the PRIDE (*Public-Private Partnership to Improve Diabetes Education*) trial (ClinicalTrials.gov identifier: NCT01344668) was a collaboration between Vanderbilt University and the Tennessee State Health Department that began in May 2011 (<https://clinicaltrials.gov/ct2/show/NCT01344668>) and lasted for four years.

2.2. Study population and data collection

Patients with type 2 diabetes were recruited from ten safety net primary care clinics in County Health Departments in the Mid-Cumberland Region of Tennessee, which serve a predominantly uninsured and underinsured clinic population that typically includes many racial and ethnic minorities.

Participants were recruited using flyers posted at the participating clinic sites and had to be ≥ 18 years old, have a clinical diagnosis of type 2 diabetes with a most recent hemoglobin A1c $\geq 7.5\%$, be able to speak English or Spanish, and had to agree to participate in the study for the full two-year duration to be eligible. In addition, those with poor visual acuity (vision worse than 20/50 using Rosenbaum Pocket Screener), significant dementia, or psychosis (per chart review or patient report) or terminal illness with anticipated life expectancy < 2 years (per health care provider or patient report) were excluded.

The institutional review boards of Vanderbilt University and the Tennessee Department of Health approved the study protocol. All participants provided written informed consent. Four hundred and eleven patients with type 2 diabetes were enrolled in the PRIDE study.

Background characteristics were collected from each participant using self-report questionnaires. Blood pressure, weight, and height were measured at each site during routine clinic visits, and most recent (within past four to six weeks) hemoglobin A1c, current diabetes therapy and medical comorbidity data were extracted from participants' medical records (Table 1).

To examine the validity of the PDQ-11, additional validated measures including the SDSCA (Toobert & Glasgow, 1995), the *Perceived Diabetes Self-Management Scale* (Wallston, Rothman, & Cherrington, 2007), the *Adherence to Refills and Medications Scale* (Kripalani, Risser, Gatti, & Jacobson, 2009), and the *Short Form Test of Functional Health Literacy in Adults* (Baker, Williams, Parker, et al., 1999) (S-TOFHLA) were administered and correlated with scores from the PDQ-11. The rationale for using these variables to assess the validity of the PDQ-11 is that the set of background characteristics are related to how competent a person with type 2 diabetes feels in self-managing their condition which, in turn, is related to what the patient does to self-manage his/her condition and, thus, the person's health status. It is expected that the dietary subscales of the SDSCA will be correlated with scores from the PDQ-11 diet-related items, and the exercise subscale of the SDSCA will be correlated with the items from the PDQ-11 that asked about exercise and physical activity. The main hypothesis is that the PDQ-11 is a better measure of dietary and exercise behaviors than the SDSCA (which is limited in the dietary information it provides with respect to specific eating practices and application of knowledge to food selection).

All measures were administered by bilingual (English and Spanish) trained research assistants either in English or Spanish depending on the participant's language proficiency or preference during routine clinic visits. The language in which the measures were administered was recorded. Of the 411 who were enrolled in the study, 92 completed the measures in Spanish at baseline.

2.3. Instruments

2.3.1. The short version of the Personal Diabetes Questionnaire

The PDQ-11 is a survey that asks about diet-related behaviors (eight items), daily exercise routine (one item), plans for exercising (one item), and plans for losing weight (one item). The 11 items were selected for the short version of the Personal Diabetes Questionnaire version by two health psychologists (KW and DS) with extensive experience in conducting weight management research based on the

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