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## Diabetes Stepping Up to the Plate: An Education Curriculum Focused on Food Portioning Skills

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## Diabetes Stepping Up to the Plate: An Education Curriculum Focused on Food Portioning Skills

### Abstract

The Diabetes Stepping up to the Plate program was developed to determine the effectiveness of food portion based diabetes education. One hundred fifty-one individuals enrolled in the diabetes series. Food portion knowledge and skills tests, height, weight, and waist-to-hip ratio (WHR) were measured pre- and post-program. Data was analyzed through paired t-tests and correlations. Evaluation showed a decrease in HbA1C, waist/hip circumference, WHR, and BMI, and an improvement in food portion knowledge and skills. Seventy-five participants completed pre- and post-data collection parameters, although more participants completed all classes in the series. Extension can play a role in successful diabetes education.

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## Introduction

Diabetes has become an epidemic in the United States. Costs related to diabetes treatment in the United States in 1997 totaled more than \$98 billion dollars annually (American Diabetes Association, 2003). In addition, chronic complications associated with diabetes contribute to disease burden, socioeconomic detriment, and decreased quality of life for millions of Americans (Utah Diabetes Association, 2003).

Evidence generated from various studies suggests that chronic complications can be prevented or delayed by improved glycemic control (Gagliardino, 2001; Ridgeway, 1999). Diabetes education programs help patients increase their knowledge about dietary management of diabetes, resulting in improved glycemic control and quality of life (Schlundt, 1994). Patients who participate in education programs demonstrate increased knowledge of diabetes management and greater compliance to the difficult treatment protocol (Gagliardino, 2001; Ford, 2000). After conducting a study of patients with diabetes in a rural health clinic, researchers noted that patients expressed great interest in learning about diabetes management if the services could be offered locally (Sullivan, 1998).

Studies also indicate that teaching dietary management skills by providing patients with information on food portioning skills, applying food label information in meal planning, and guidelines from the Food Guide Pyramid (FGP) have been effective in helping patients improve

their glycemic control (Sullivan, 1998; Yuhas, 1989). Diabetes control has also been shown to improve when dietary instruction includes behavioral intervention that is based on specific circumstances (Schlundt, 1994). Including specific situational obstacles in educational plans can result in better glycemic control, which may improve the quality of life and reduce disease burden (Tankova, 2001).

Because traditional diabetes education and treatment are typically performed in a hospital/medical center to either inpatients or outpatients, it may not be widely available to all patients. Barriers to education include, but are not limited to, economic status, unawareness of available programs, lack of transportation, and English as a second language (Sullivan, 1998; Chin, 2001). Other barriers may include the loss of wages from missed work and the general cost of healthcare (Rubin, 2000). These factors demonstrate a serious need for inexpensive, local diabetes management programs that can be made available to all patients.

The purpose of the study described was to verify whether or not education, based upon the FGP and provided by Family and Consumer Scientists with extensive training in food portioning (yet not medically trained), could increase patient treatment participation and improve glycemic control. It was expected that the education provided to the participants would be important in substantially reducing subsequent complications as well as providing insight into how diabetes education can be extended to all members of the population.

## **Objectives/Purpose**

The objective of the study was to assess the effectiveness of a 3-month diabetes education class focused on food portioning skills through reduction in weight, hip circumference, waist circumference, body mass index, and improvement in a written knowledge test on food portions and a test on food portioning skills.

## **Methods**

### **Subjects**

Participants (n=151) in this interventional field study came from nine counties within Utah. They responded to local advertisements for diabetes education classes through Utah State University Extension. Cost for participation varied from county to county, but was minimal to cover class handouts and food demonstrations.

- Participants ranged in age from 20-83. The average age of the group was 54.5 ± 11.9 years.
- Six percent of subjects had type 1 diabetes mellitus, 68% of subjects had type 2 diabetes mellitus, and 26% took the course for a spouse or friend who had diabetes.
- The age at diabetes diagnosis ranged from age 2 to age 82, with an average age of 54.1 ± 13.9 years.

### **Education Curriculum**

Curriculum was developed by senior dietetic students as part of a research project to determine the effectiveness of food portion education on diabetes outcomes. The curriculum was reviewed by an Extension specialist and an Extension agent and then sent out of state for peer review. Each class in the curriculum was pilot tested before the final version was incorporated into the curriculum.

The curriculum included five instructional classes and two data collection periods presented over a 3-month period. Classes were held every other week in the evening or day time based on participant demand. Each series included three core classes emphasizing food portioning skills: Food Guide Pyramid, serving sizes, and label reading. Instructors then chose two elective classes, also emphasizing food portioning skills, from the following: situational obstacles to dietary adherence, holidays, eating out, diabetes on a budget, and cooking demonstrations. Guest speakers were also invited to discuss new diabetes products, insurance coverage, medications, and community resources.

### **Evaluation Methods**

Data was collected on participants during the first class of the series and again at 3-months. Evaluation consisted of:

- Food portion knowledge test
- Food portion skills test
- Anthropometric data
- Glycosylated hemoglobin (HbA1C)

### **Knowledge Test**

A 35-question, written, multiple choice test was given to participants pre-course and post-course to

determine food portion knowledge.

### **Skills Test**

Each participant passed through a buffet line, pre- and post-course, and was asked to correctly load a plate with five portions of 15 grams of carbohydrate or 75 grams of carbohydrate. Buffet choices included items such as pasta, rice, corn, beans, tortillas, bread, vegetables, fruit, and milk. Participants rotated through the buffet line one at a time.

To discourage participants from seeing each other's choices (or anthropometric data), a line on the floor was marked with masking tape, which the participants stood behind until their turn. To further disguise the choices of measuring cups chosen by the previous participants, the full set of measuring cups, provided for each food, (1/4, 1/3, 1/2, etc.) were dipped in the food (e.g., beans) after the first participant made his/her choice of food portions.

It was stressed that the measuring skill be practiced at home, with repeated practice every other month. The learned skill would be helpful in estimating portion sizes at restaurants and when invited to the homes of friends and family.

### **Anthropometric Data**

Weight, height, BMI, waist circumference, hip circumference, and waist to hip ratio (WHR) were collected at initiation of the series and 3 months later.

### **Clinical Data**

Glycosylated hemoglobin (HbA1C) was analyzed using the DCA 2000+ at the initiation of the series and 3 months later.

### **Statistics**

Statistical analysis included paired t-tests, analysis of variance (ANOVA), and correlations on anthropometric data, food portion knowledge, food portion skills, and glycemic control.

## **Results**

There was a significant reduction in weight, waist circumference, hip circumference, and glycosylated hemoglobin, as well as an improvement in food portion knowledge and skill after completion of the diabetes education series. The age range of participants was 20-83; ANOVAs revealed no significant difference between age groups, indicating success in all age groups. The results from the study are listed in Table 1 and discussed below.

**Table 1.**

The Differences Observed in Various Parameters After Completion of Educational Series

|                   | <b>N</b> | <b>Mean</b> | <b>Standard Deviation</b> | <b>Significance (p)</b> |
|-------------------|----------|-------------|---------------------------|-------------------------|
| Weight 1 (pounds) | 75       | 203.7       | 46.1                      | .000                    |
| Weight 2 (pounds) |          | 200.5       | 45.9                      |                         |
|                   |          |             |                           |                         |
| Waist 1 (inches)  | 69       | 42.7        | 6.6                       | .000                    |
| Waist 2 (inches)  |          | 41.3        | 6.2                       |                         |
|                   |          |             |                           |                         |
| Hip 1 (inches)    | 67       | 46.1        | 5.3                       | .003                    |
| Hip 2 (inches)    |          | 45.5        | 5.5                       |                         |
|                   |          |             |                           |                         |
|                   |          |             |                           |                         |

|  |    |       |      |      |
|--|----|-------|------|------|
| Waist/Hip Ratio 1                          | 67 | .92   | .08  | .011 |
| Waist/Hip Ratio 2                          |    | .90   | .08  |      |
|  |    |       |      |      |
| BMI 1 (kg/m <sup>2</sup> )                 | 75 | 32.9  | 7.8  | .019 |
| BMI 2 (kg/m <sup>2</sup> )                 |    | 32.0  | 6.9  |      |
|  |    |       |      |      |
| Food Portion Knowledge 1                   | 65 | 49.8% | 16.4 | .000 |
| Food Portion Knowledge 2 (percent correct) |    | 60.5% | 16.3 |      |
|  |    |       |      |      |
| Food Portion Skill 1                       | 68 | 2.4   | 1.1  | .000 |
| Food Portion Skill 2 (number correct of 5) |    | 3.7   | 1.3  |      |
|  |    |       |      |      |
| HbA1C 1 (%)                                | 48 | 7.14  | 1.35 | .000 |
| HbA1C 2 (%)                                |    | 6.43  | 1.11 |      |

### Anthropometrics and Clinical Data

- Mean weight decreased from 203.7 to 200.5 pounds (p=.000).
- BMI decreased from 32.9 to 32.0 (p=.000).
- Mean waist circumference decreased from 42.7 to 41.3 inches. (p=.000).
- Mean hip circumference decreased from 46.1 to 45.5 inches (p=.000).
- Waist to hip ratio decreased from 0.92 to 0.90 (p=.000).
- Mean HbA1C decreased from 7.14 to 6.43 (p=.000).

### Food Portion Knowledge Test

The average pre-test knowledge score was 49.8%, which increased to 60.5% for post-test scores (p=.003). Knowledge was based on the participants' ability to identify correct portion sizes for specific foods in a multiple choice written exam. There was a predictive correlation between the written knowledge test scores and both waist circumference loss and hip circumference loss (Table 2).

**Table 2.**

Correlations Between Anthropometric Variables with Food Portioning Skills and Written Knowledge Test Scores

|                        | Weight Loss | Waist Loss | Hip Loss | Waist to Hip Ratio |
|------------------------|-------------|------------|----------|--------------------|
| Food Portion Knowledge | --          | -.263*     | -.306*   | --                 |

|  |         |    |    |        |
|--|---------|----|----|--------|
| Food Portion Skills                      | -.228** | -- | -- | -.298* |
| * p=.05 (correlation)<br>**p=.06 (trend) |         |    |    |        |

## Food Portion Skills

The ability to correctly choose five exchange portions of 15 grams of carbohydrate was 2.4  $\diamond$  1.1 at the initial testing and 3.7  $\diamond$  1.3 (p=.000) at post-testing. There was a correlation between the food portioning skills score and the waist to hip measurement changes (p=.05). There was also a trend (p=.06) for the correlation between food portioning skills and weight loss (Table 2). Although the correlations were small they were statistically significant.

## Discussion

Evaluation of the Diabetes Stepping Up to The Plate program indicated that diabetes instruction by Extension personnel, using the Food Guide Pyramid, can be successful in diabetes control parameters. The program showed a significant reduction in anthropometric indices at the same time knowledge and skill for food portioning increased. Many studies have indicated that knowledge, waist-to-hip ratio, and measures of glycemic control are closely related (Daniel, 1999; Kennedy, 2001; Lyznicki, 2001; Miller, 1999; Ogden, 2000; Williams, 2000,). This study concurred with these findings, showing an improvement in glycemic control.

This program shows great promise in developing a method of diabetes education that can be offered to all persons. The curriculum allows for low-cost classes to be offered to those from low socioeconomic class, rural populations, and elderly persons. Earlier studies have indicated that these groups, although eager for education, are often missed due to the medical-based structure of most diabetes education (Ford, 2000; Sullivan, 1998; Tankova, 2001).

The FGP-based classes offer a means whereby non-medical personnel can offer effective education to all people with diabetes, regardless of class, race, geography, or socioeconomic status. There is tremendous potential to improve glycemic control, decrease medical costs due to the complications of diabetes, and improve the health of the general population. The next step for this program will be to focus on an in-depth application of cooking/portion skills, which will be analyzed for its effect on glycemic control (analyzed by ANOVA).

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