

A Survey of Diabetic Educators and Patients for the Revision of Korean Food Exchange Lists

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Background: Food exchange lists are one of the main methods of nutritional education. However, Korean food exchange lists have not been revised since 1994. Therefore, we surveyed the opinions of diabetes educators and patients with diabetes regarding the need for revision of the current food exchange lists.

Methods: For two weeks beginning on 10 March 2008, a 12-item questionnaire regarding the opinion and need for revision of the current food exchange lists was e-mailed to diabetes educators nationwide. Another 15-question survey was administered to patients with diabetes in 13 hospitals located in the Seoul and Gyeonggi regions of Korea.

Results: We obtained survey responses from 101 diabetes educators and 209 patients; 65 (64.3%) of the educators answered that the current food exchange lists should be revised. The items that needed revision were the glycemic index, addition of new foods and reaffirmation of exchange standard amounts. The patients demanded specific education about choosing appropriate foods, a balanced meal plan, proper snacks, and dining intake.

Conclusion: Our survey results demonstrate the need to revise the Korean food exchange lists. This process should focus on glycemic index, the addition of new foods and reconfirmation of one exchange reference unit.

Keywords: Diabetes; Food exchange lists; Korean; Medical nutritional therapy

INTRODUCTION

The food exchange lists for medical nutrition therapy (MNT) education are the grouping of foods into general categories

that are similar in macronutrients and calories per serving size. The 2nd edition of the Food Exchange Lists for People with Diabetes developed by the Korean Diabetes Association, the Korean Dietetic Association, and the Korean Nutrition So-

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ciety had six food categories (starch, meats, vegetables, dairy, fruits, and fats), and for each category, foods of similar exchange units can be freely exchanged and consumed [1]. This exchange lists have been used not only as educational tools for diabetes but also as a method for managing obesity and other chronic diseases.

The first edition of South Korea's food exchange lists were developed in September 1987 by the Korean Diabetes Association, the Korean Dietetic Association, and the Korean Nutrition Society through a joint research effort to make food categories and quantify exchange units for each food category. In 1993, modification of exchange unit in some food products and aesthetic corrective action for food samples was taken. The 2nd edition of Korean Food Exchange Lists and Guidelines were revised in 1995 [2]. However, the recent dietary pattern and intake in South Korea is rapidly changing due to economic growth, westernized lifestyles and the development of food processing technology. Personalized education that considers individual dietary preferences and pattern is currently increasing in popularity as the importance of individualized MNT is becoming better recognized. So, the supplement or revision of the food exchange lists for Korean diabetic patients, that reflects a proper diet and also encourages willpower for proper eating habits, is needed. Although the food exchange lists are useful tools for adjusting the amounts of food intake and its macronutrient composition in patients with diabetes, but there were several reports that understanding the concept of food exchange lists and practicing it is difficult in patients with lower education [3]. Thus demand for improvements to the food exchange lists is also rising.

In the United States, the American Diabetes Association (ADA) and the American Dietetic Association jointly issue educational materials and revise the food exchange lists for patients with diabetes. These lists were revised in 1995 to include the carbohydrate counting [4]; in later editions, the presenting food products were enlarged to reflect recent changes of dietary pattern, development of new foods, individual dietary habits, and diverse food preference. To simplify the usage, some food categories were changed, the Plant-Based Protein list was added in the Meats and Meats Substitutes category and mixed foods and fast foods lists, and alcohol lists were added in 2008. In addition, some foods were deleted, and other new foods were added after reflecting the recent nutritional recommendations and guidelines, the survey response from diabetes educators, and the food market survey [5], and the

total of over 700 foods were represented. In Japan, educators are using a varied food exchange system instead of a unified food exchange lists. The Japanese Diabetes Society used a scoring method that matched one food exchange unit to 80 kcal for the convenient calculation of caloric intake.

As a preliminary work for the revision of the food exchange lists for Korean patients with diabetes, the Food and Nutrition Committee of the Korean Diabetes Association made a survey sent to diabetes educators, physicians, and patients with diabetes to evaluate food exchange lists options in March of 2008.

METHODS

Subjects and methods of survey

Over a two-week period beginning on March 10, 2008, the Korean Diabetes Association sent out a survey via e-mail to approximately 600 registered diabetes educators and physician members, and 101 of them responded. A survey for patients with diabetes was administered in 13 hospitals around Seoul and the Gyeonggi province. We collected the responses from 209 patients with diabetes.

The survey for the diabetes educators and physicians included general questions (regarding career, hospital size, and their methods of diabetes education), and 8 nutritional education questions (length of the education session, presence of continuing nutritional education, educational materials, etc.) and 4 questions about the practical use of the food exchange lists (advantages or disadvantages of the food lists, possible improvements to the food lists, etc.). The survey for patients with diabetes had 15 questions. Eight questions assessed general characteristics (sex, age, height, weight, and educational level) and clinical characteristics (duration of diabetes, fasting glucose concentration, glycated hemoglobin level, treatment modality, and presence of complications), and 7 questions pertained to diabetes education (diabetes educational experience, period of education, recollection of education, effect on glucose control, degree of practice, what kind of contents one may want to).

Statistical analysis

Statistical analysis was carried out using the SPSS version 15.0 (SPSS Inc., Chicago, IL, USA). We compared the demographic and clinical characteristics of the subjects between men and women using the chi-squared test for categorical variables and student *t*-test for continuous variables.

RESULTS

Results of diabetes educators' survey

Among the diabetes educators and physicians who responded to the survey, 30 were physicians (29.7%), 55 were dietitian (54.5%), and 16 were nurses (15.8%). Among them, 59 educators and physicians (58.4%) worked at the tertiary hospitals, and 39 educators/counselors (38.6%) worked at the secondary hospitals. According to our survey, 38.6% of them conducted an individual and group diabetes education; 32.7%, individual, group, and other diabetes education (breakfast buffet, buffet, camp, and so on), and 12.9% were individual, group, intensive, and other diabetes education (Table 1). The average length of one education session was 39.5 ± 11.5 minutes, and 60% of the respondents reported that they conducted a follow-up nutritional education, but 40% could not conduct a follow-up education. We collected responses to questions from dietitians pertaining to the tools used in the nutritional education, 49 (89.1%) dietitians were using the food exchange lists in nutritional education. Six (10.9%) responded that they used the food exchange list and carbohydrate counting (Table 2).

A ranking system was used to figure out the best advantages

Table 1. Characteristics of diabetes educator respondents

All response (<i>n</i> = 101)	No. (%)
Occupation	
Physician	30 (29.7)
Dietitian	55 (54.5)
Nurse	16 (15.8)
Hospital size	
Tertiary	59 (58.4)
Secondary	39 (38.6)
Primary	2 (2.0)
Other	1 (1.0)
Type of diabetes education	
Individual education	8 (7.9)
Group education	1 (1.0)
Individual and group education	39 (38.6)
Individual and other education ^a	1 (1.0)
Individual, group, and intensive education	4 (4.0)
Individual, group, and other education ^a	33 (32.7)
Intensive and other education ^a	2 (2.0)
Individual, group, intensive, and other education ^a	13 (12.9)

^aOther education: breakfast buffet, buffet, camp, and so on.

of the usage of food exchange lists in diabetes education. The number-one priority was given 3 points, the number-two priority was given 2 points, and the number-three priority was given 1 point. The highest score with 238 points from the dietitian responders was "Emphasizing a balanced diet." The second highest score (172 points) was "Using unified educational tools for diabetes education." The third highest score with 97 points was "A useful educational tool for calorie intake and carbohydrate intake," and the "It reflects the Korean food consumption pattern well" item received 95 points. The most common response related to difficulty in educating patients using the food exchange lists was, "It is difficult for the patients to understand" (143 points). The second most common response was, "The food variety is not adequately represented" (106 points), followed by, "It is not sensitive to the glycemic

Table 2. Dietitian responses

Dietitian response (<i>n</i> = 55)	No. (%)
Duration of one education session, min	
20-29	5 (9.1)
30-39	17 (30.9)
40-49	20 (36.4)
50-60	6 (10.9)
>60	7 (12.7)
Follow-up nutritional education	
Always	2 (3.6)
Mostly	10 (18.2)
Sometimes	21 (38.2)
Rarely	19 (34.6)
Not at all	3 (5.5)
Follow-up education	
Education fee is charged	11 (21.2)
Education fee is not charged	39 (75.0)
No following-up education	
Lack of patient awareness	15 (31.9)
Lack of physician awareness	8 (17.0)
Cost of patient counseling	13 (27.7)
Shortage of dietitians	23 (48.9)
The others	6 (12.8)
Tools of education	
Carbohydrate counting	0 (0.0)
Food exchange lists	49 (89.1)
Both	6 (10.9)

index or the carbohydrate amounts” (91 points), “It does not reflect current dietary patterns” (88 points), and “There is too much contents to learn in the allotted time” (70 points) (Table 3).

We had 65 replies (64.3%) that stated that “Supplements are required” to the food exchange lists for diabetes education. Thirty respondents (29.7%) said the current food exchange lists are “Generally satisfactory,” and 5 replies (5%) stated “A different educational tool is required.” The most commonly

Table 3. Diabetes educators’ opinions of the current food exchange list

Categories (ranking)	Score
The merits of food exchange lists use	
1. It is a suitable method for emphasizing a balanced diet	238
2. It is easy to use as a unified teaching tool	172
3. It is useful in educating about not only carbohydrate but also caloric intake	97
4. It reflects the eating patterns of Koreans well	95
The difficulties of food exchange lists utilization	
1. It is difficult to make patients understand	143
2. It does not reflect food diversity	106
3. It is not sensitive to glycemic index and carbohydrate content	91
4. It does not reflect the current dietary pattern	88
5. There are too many items to explain in one education session	70

selected response related to supplements for the food exchange lists was “The reflection of the starch category’s glycemic index” with 51 replies (64.6%). We had 47 participants (59.5%) who stated that “New foods should be added to the food lists,” and 43 (54.4%) responded that “Each food category requires confirmation of one exchange reference unit.”

When responses among different occupations were compared, dietitians answered that “The confirmation of one exchange reference unit per food category,” “Adding new foods to each food lists,” and “The reflected glycemic index into the starch category” were all needed. A large number of physicians and nurses replied that “Reflection of the glycemic index into the starch category” is necessary, but most of them responded that “Confirmation of one exchange reference unit” was unnecessary (Fig. 1).

Survey results from diabetic patients

The male-to-female distribution of diabetic patients who responded to the survey was 53.6% males and 46.4% females. The average fasting blood glucose level of males was significantly higher than that in females, whereas the percent ideal body weight was significantly higher in females than in males. The male participants tended to have a higher education level than the female participants (Table 4). Among male participants, 46.7% had a bachelor’s degree or higher, while 36.8% of females had finished elementary school.

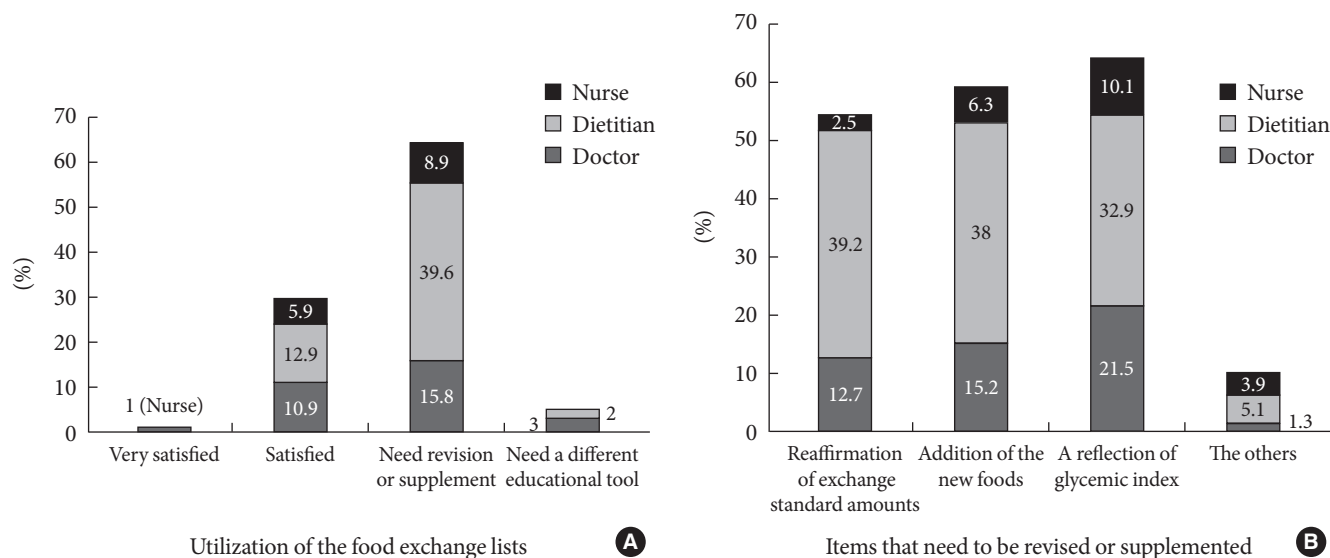


Fig. 1. Results of the survey of diabetes educators. (A) Utilization of the food exchange lists. A majority (64.3%) of diabetes educators answered that the current food exchange lists should be revised. (B) Items that need to be revised or supplemented. The items that need revision were glycemic index, addition of new foods and reconfirmation of one exchange reference unit.

Table 4. Characteristics of diabetic patient respondents

Characteristic	Males (n=112)	Females (n=97)	Total (n=209)
Age, yr	55.43±11.72	58.88±12.43	57.02±12.15
Height, cm	168.95±5.42	155.27±5.93 ^a	162.68±8.87
Weight, kg	70.08±13.08	59.89±10.08 ^a	65.33±12.81
Percent ideal body weight, %	111.2±16.55	118±18.14 ^a	114.40±17.60
Fasting plasma glucose, mg/dL	198.64±120.28	161.48±81.43 ^a	181.82±105.88
HbA1c, %	8.91±2.55	8.41±1.82	8.68±2.26
Educational level ^a			
Elementary school	8 (7.6)	32 (36.8)	40 (20.8)
Middle school	15 (14.3)	17 (19.5)	32 (16.7)
High school	33 (31.4)	23 (26.4)	56 (29.2)
College and above	49 (46.7)	15 (17.2)	64 (33.3)

Data are presented as mean ± standard deviation or number (%).

^aP<0.05.

Table 5. Response of diabetic patients pertaining to previous nutritional education

Response	Males (n=50)	Females (n=48)	Total (n=98)
Previous diabetes education ^a			
Grain group	19 (38.0)	26 (54.2)	45 (45.9)
An allowable amount for fruits	25 (50.0)	34 (70.8)	59 (60.2)
Sugary foods	19 (38.0)	30 (62.5)	49 (50.0)
Daily intake amount/serving size	16 (32.0)	19 (39.6)	35 (35.7)
Tips for snack	18 (36.0)	28 (58.3)	46 (47.0)
Free food	12 (24.0)	23 (47.9)	35 (35.7)
Importance of regular and balanced meals	28 (56.0)	29 (60.4)	57 (58.2)
Caution of fat from the meat	24 (48.0)	17 (35.4)	41 (41.8)
Caution of salt intake	18 (36.0)	19 (39.6)	37 (37.8)
Food for hypoglycemia	17 (28.0)	20 (41.7)	37 (37.8)
Nutritional education is valuable			
Strongly agree	11 (22.0)	15 (32.6)	26 (28.0)
Agree	14 (28.0)	13 (28.3)	27 (29.0)
Neither agree nor disagree	12 (24.0)	11 (23.9)	23 (24.7)
Disagree	8 (16.0)	6 (13.0)	14 (15.1)
Strongly disagree	1 (2.0)	1 (2.2)	2 (2.2)
Nutritional education			
The contents of education is difficult	5 (10.0)	4 (8.9)	9 (9.9)
One education session is enough	11 (22.0)	18 (40.0)	29 (31.9)
I need 2-3 detailed education sessions	12 (24.0)	6 (13.3)	18 (19.8)
I need regular education sessions	18 (36.0)	17 (37.8)	35 (38.5)

Duplicate answers are possible. Data are presented as number (%).

^aPatients with diabetes who received nutrition education for diabetes.

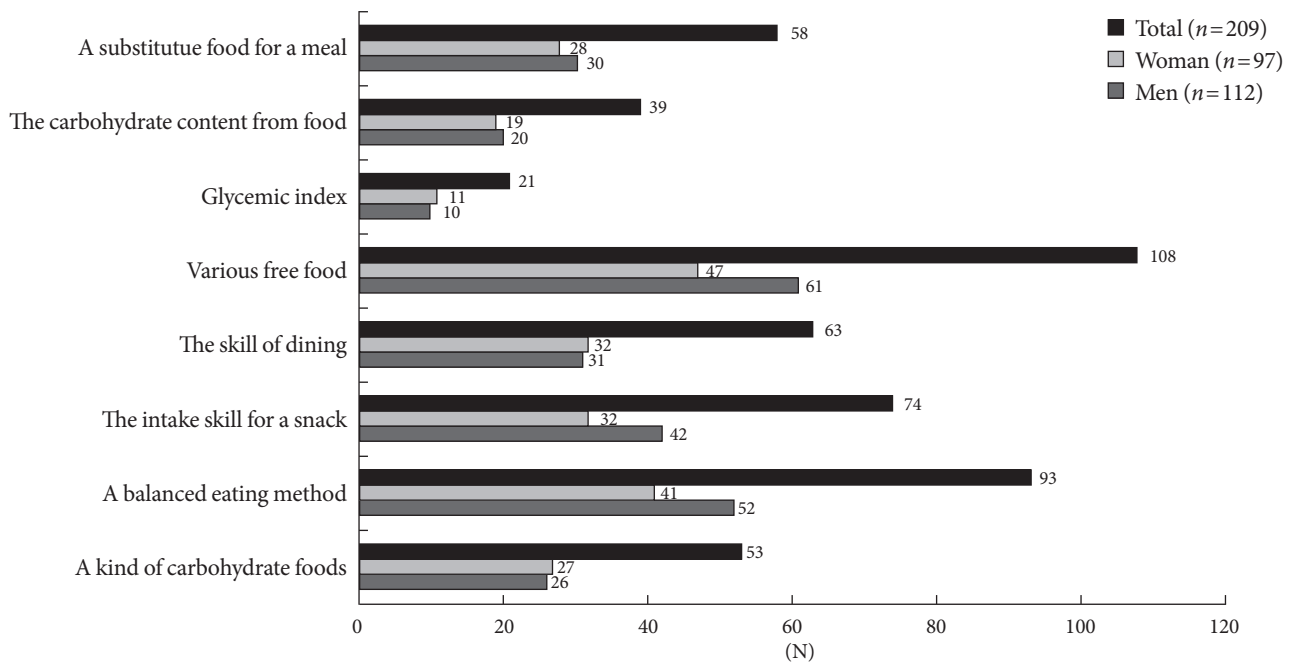


Fig. 2. Content of nutritional education requested by diabetic patients. The patients demanded specific education about free food, a balanced meal plan, tips for snacks, and dining.

Ninety-eight patients (47.1%) had received the diabetes nutritional education previously, while 110 patients (52.9%) did not have any nutritional education. In the patients with diabetes that received nutritional education previously, the contents of education that male patients could recall was ‘the importance of a regular and balanced meal,’ ‘the allowed amount of fruit,’ and ‘to be careful of fats in meats’ (Table 5). In female patients, the recalled contents were ‘the allowed amount of fruit,’ ‘the food lists of starch,’ ‘the importance of a regular and balanced meal,’ and ‘how to eat snacks.’ The number of responders who recalled their daily calorie intake and serving size of each food category was only 35 (35.7%). However, the respondents had a better recollection of the regular and balanced meals and some of starch food lists.

The necessity of nutritional education appears to be sufficiently recognized, since 28% was strongly agreed, and 29% was agreed that the nutritional education was helpful for diabetes management. In term of nutritional education frequencies, 38.5% said that “Periodic re-education is required,” but 31.9% replied that “The initial education was sufficient.”

The most preferred content of nutritional education was questioned to 209 participants. We found that 108 patients (51.7%) wanted to know what kinds of foods they could consume without a rise in blood sugar; 93 patients (44.5%) sought

further information on a balanced diet (Fig. 2). Additionally, 74 patients (35.4%) wanted tips for eating snack, and 63 patients (30.1%) asked for tips when eating out. We examined whether any differences existed on the kinds of information patients would like to get during education sessions according to educational level. Regardless of educational level, most patients wanted to know what kinds of foods could be consumed without a rise in blood sugar.

DISCUSSION

In this study, diabetes educators pointed out difficulties in using the food exchange lists as an educational tool. It was consistent with results of 2001 survey of dieticians from Seoul Metropolitan area regarding awareness and revisions to the food exchange lists, 39% of the dietitians felt that using the food exchange lists was difficult, 26% felt that it was too complex, and 23% said that it was confusing for patients with diabetes [6]. To better understanding of exchange lists, 88% of the participants felt that the lists should be amended or at least partially modified. The American Dietetic Association recommends the food pyramid in the initial education, the exchange lists and the carbohydrate counting in the subsequent education for the effective MNT according to the stage of education.

Nurss et al. [7] reported that the educational content from the food exchange lists was difficult to understand, particularly in patients with a lower level of education. Therefore, a method should be developed to divide the food exchange lists into the following steps: 1) initial stage food exchange lists (varied foods from each food group, introducing starch and free foods); 2) intermediate step food exchange lists (recommended calories, nutrients and one exchange reference unit per food group, and basic concept of carbohydrate counting) for subsequent education; 3) late-stage food exchange lists (advanced carbohydrate counting, and introducing the glycemic index) for intensive education.

The food exchange lists was revised in 1994; in order to reflect changes that have taken place since then, new foods should be added to each food group to fit current dietary habits. Even with similar types of foods, one exchange unit may vary according to the size and variety of food, and confirmation of the reference equivalent of one exchange unit is required.

When the trends of the Korean National Health and Nutrition Examination Survey were examined [8,9], they found that carbohydrate consumption has been steadily decreasing since 1969, while average daily meat and dairy amounts consumed per day increased from 6.6 g and 2.4 g, respectively, in 1969 to 93.9 g and 90.2 g in 2007. Beverage and alcohol consumption also increased nearly 1.5-fold from 94.2 g in 1998 to 154.3 g in 2007, particularly beer and Soju, which accounted for the fourth and fifth most consumed food. A dietary pattern survey from 2005 revealed that 40% of teenager and young adults do not eat dinner with their families, and a survey from 2007 found that the higher income families tended to eat together less often and were more likely to eat snacks and eat out. Another study that analyzed the Korean National Health and Nutrition Examination Surveys from 1998 and 2001 found that as economic status increased, the consumption of Kimchi declined while noodle/dumpling-like food consumption increased [10]. In the study presented by Song et al. [11], younger age, higher educational level and annual income, and larger city size were associated with a higher consumption of noodles, bread, fast foods, meat, dairy, and sugary beverages. Additionally, in this study, we found that participants most often suggested the addition of free food that patients could eat without raising blood sugar, as well as snacking/dining out options. The comparative free foods, such as clear vegetable soups, seaweed, low-sugar vegetables, and drinks such as black tea, green tea, and diet cola were proposed for the nutritional edu-

cation program; a list of low-sugar vegetables and a clear and varied method for identifying existing types of free foods, drinks and spices that can be added are also required. Additionally, a standardized way by which to measure food consumption is needed in terms of sugar content so that changes in blood glucose level do not occur. The addition of food amounts of each group on the food exchange lists is important in order to enable patients to select foods that are easily accessible in everyday life. In order to expand the current food exchange lists to include various snacks, restaurant foods, high alcohol consumption, and so on, that do not fit into the current six existing food groups, the nutritional information for these items must be reviewed.

In the results of this study, the food exchange lists was used most often as an educational method. However, 10.9% of educators stated that carbohydrate counting was being used in combination with the exchange lists. In 2005, survey reports from 25 hospitals showed that 11 of these hospitals were using the carbohydrate counting, 8 hospitals were using carbohydrate counting as an educational method and 7 were using it according to the type of patient and their education level. The carbohydrate counting is gradually developing interest and is being applied based on patient's education level and educational goals in a basic course (eating a certain amount of carbohydrates at set times every day with set snack distribution) and an advanced course (adjusting insulin dose according to the amount of carbohydrates consumed; calculating the glucose to insulin ratio) [12,13]. The United States revised the fourth edition of their food exchange lists to include the carbohydrate counting in a new food exchange lists system. One exchange unit from the grain, fruit, dairy or other carbohydrate group is treated as one serving size (15 g) so that foods from these groups can be interchanged. However, in the Korean food exchange lists system, the nutrient content among grain, dairy and fruit groups is different; therefore, they cannot easily be exchanged. In addition, the one serving size of carbohydrate should be standardized to exchange, but each hospital uses different serving size, which makes the system confusing. In South Korea, the carbohydrate content of various carbohydrates must first be properly quantified before the carbohydrate counting can be successfully implemented. Additionally, standardized educational materials and guidelines for the carbohydrate counting should be prepared.

In this study, 64.6% of educators replied that "The reflection of glycemic index of carbohydrate group" was a field that re-

quired supplements. The glycemic index reflects the specific foods' postprandial glucose absorption rates compared with standardized food. The 2008 ADA recommends using the glycemic index while also maintaining a constant total consumption of carbohydrates through a supportive method of controlling blood sugar [14]. The glycemic index lists of various foods that have been published in other countries are difficult to apply to Korean foods. To correct this problem, it is needed to provide applicable glycemic index through the progress of domestic studies about the glycemic index. Additionally, when a glycemic index is being used, factors affecting it (carbohydrate structure, fiber content, preparation/production process, maturity of the food, storage conditions, presence of digestive enzyme, simultaneous intake of proteins or lipids, and so on) should be considered. The fact that the glycemic index of a food product can vary based on the person and individual circumstances must be considered. Use of the glycemic index only recognizes the benefits and downsides to certain foods, and in order to prevent destructive dieting patterns, current nutritional education programs need to always emphasize the value of a balanced diet while also confirming that patients have an accurate understanding of the advantages, disadvantages and application methods of the glycemic index.

In conclusion, our survey found that the majority of the diabetes educators used the food exchange lists as a tool for nutritional education. The results also showed that most participants felt that a revision or supplement to the food exchange lists was required. These respondents suggested that these supplemental items include the glycemic index of carbohydrate foods, the addition of new foods and the confirmation of an exchange reference unit. In the survey results from the diabetic patients, we found a high demand for tips on various free foods and for snacks/restaurant foods. Therefore, to represent the diversity of food, a new food lists should be added, and in order to confirm the one exchange reference unit of each food group and to reflect the glycemic index in the Korean food exchange lists, various evidence and data should be collected. The standardized carbohydrate counting must be arranged based on the revised food exchange lists. In addition, it must compensate for gradually increasing changes in mixed food eating patterns and represent the needs of nutritional education recipients. Nutritional information is also required for various restaurant foods and snacks, and ways to recommend food selection guidelines should also be considered.

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