# Carbohydrate -Food knowledge of Emirati and Omani Adults with Diabetes: Results of a pilot study

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**Abstract**

There is limited research on nutrition knowledge related to diabetes management in persons with diabetes in the United Arab Emirates and other Arabian Gulf countries. Carbohydrate – containing foods have the greatest impact on post-meal blood glucose levels. The purpose of this exploratory study was to determine nutrition knowledge related to carbohydrate-containing foods of adults with diabetes in Oman and the United Arab Emirates. A culturally-appropriate questionnaire was used to assess carbohydrate - food knowledge in a convenience sample of 94 Emirati and Omani men and women with diabetes (age (mean± s.d.): 50 ± 13.5 years) residing in the cities of Al Ain and Al Bureimi. Carbohydrate-food knowledge score (mean± s.d.) was 6.3 ± 2 (maximum 14), reflecting low knowledge of food sources of carbohydrate. Ninety-three percent of the study participants believed that whole wheat bread does not increase their blood glucose levels and 88% of them did not think that unsweetened fruit juices can increase blood glucose levels. Further, scores for the Omani citizens were significantly lower than those of Emirati counterparts, mean difference 2.3 (95% confidence interval:1.5-3.1). Significant ($p<0.05$) differences in carbohydrate food knowledge scores between the 2 groups were found for 5 of the 14 food items assessed. The results of this study underscore the importance of nutrition education programs for persons with diabetes in these 2 communities.

**Introduction**

Diabetes mellitus is a major cause of coronary artery disease, a leading cause of death in the United Arab Emirates. (Department of Preventive Medicine, Annual Report 2004; Ministry of Health, Abu Dhabi, UAE, May 2006) According to a recent nation-wide study, nearly 25% of Emirati adults have diabetes.[1] High prevalence rates of diabetes have been also reported in other countries in the Arabian Gulf.[2-4] Previous studies in Oman reported a crude prevalence of diabetes of 10-16%.[5,6] Diabetes is a chronic disease that requires lifestyle changes. Metabolic control achieved through medical nutrition therapy, physical activity, and medications (when needed) improve quality of life, treat and prevent diabetes complications.[7-10] Effective diabetes self-management requires that persons with diabetes acquire the necessary knowledge and skills to change their nutrition-related behaviors. Carbohydrate–containing foods have the greatest impact on post-meal blood glucose levels. Therefore, knowledge of foods containing carbohydrate is important for persons with diabetes in order to optimize their glycemic control. Currently, there is limited research on nutrition knowledge

related to diabetes management of persons with diabetes in the United Arab Emirates and other Arabian Gulf countries. The aims of this study were to assess nutrition knowledge related to carbohydrate-containing foods and sources of nutrition advice on diabetes in a convenience sample of Emirati and Omani adults with diabetes.

**Materials and Methods**

Participants of the study were 42 Emirati and 52 Omani adult men and women recruited from community health centers and hospital-based outpatient clinics in the 2 neighboring cities of Al-Ain (UAE) and Bureimi (Oman). A culturally-appropriate questionnaire was developed and pre-tested with the target population. The questionnaire, containing a list of 14 food items commonly consumed by Emirati and Omani citizens, was administered by 2 senior students in nutrition (ST and BA). Following informed consent, subjects were interviewed to obtain demographic information, existence of other chronic diseases, diabetes duration, current treatment for diabetes, and source of diabetes-related nutrition information. Interviews were conducted from October 2005 to March 2006. Nutrition knowledge of each participant was evaluated by asking him/her what kinds of food he/she thinks will increase blood sugar levels. Each correct response was assigned a value of 1 and an incorrect response was calculated as 0, with a possible maximum score of 14. Food items that normally contain more than 5g of carbohydrate per serving were classified as having the potential to increase blood sugar

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**Table 1:** Demographic characteristics of the participants

| Age (years) | Percent |
|---|---|
| N=91 | |
| Mean (SD):50.1(13.5) | |
| 21- 35 | 12.8 |
| 36- 50 | 41.5 |
| 51- 65 | 28.7 |
| > 65 | 13.8 |
| **Education level** | **Percent** |
| N = 94 | |
| None | 30.9 |
| Primary | 25.5 |
| Intermediate | 18.1 |
| Secondary | 14.9 |
| Post-Secondary | 10.6 |
| **Body Mass Index (BMI)[a]** | **Percent** |
| N=87 | |
| Mean (SD):30.0 (5.56) | |
| Underweight (< 18.50) | 1.1 |
| Normal weight (18.5- 24.9) | 17.2 |
| Overweight ( 25.0- 29.9) | 33.3 |
| Obesity ( 30.0- 39.9) | 43.7 |
| Morbidly obese (≥ 40) | 4.6 |

[a]BMI $(kg/m^2)$

**Table 2:** Clinical parameters of the subjects

| Diabetes duration | Percent |
|---|---|
| N = 94 | |
| 1 year or less | 29.8 |
| 2-5 years | 22.3 |
| 6-10 years | 14.9 |
| more than 10 years | 33.0 |
| **Diabetes treatment** | **Percent** |
| N = 94 | |
| Diet only | 12.8 |
| Diabetes pills | 64.9 |
| Insulin | 12.8 |
| Insulin & diabetes pills | 9.6 |
| **Diseases co-existing with diabetes** [1] | **Percent** |
| N = 94 | 12.8 |
| Hypertension | 2.1 |
| Heart disease | 17.0 |
| Hyperlipidemia | 9.6 |
| Other | 37.2 |
| Multiple conditions[2] | 21.3 |
| None | |

[1]Self-reported chronic conditions, [2]Multiple conditions = diabetes co-existing with at least 2 of the following chronic conditions: hypertension, hyperlipidemia, heart disease

**Table 3:** Carbohydrate–food knowledge of the participants

| Food Item | Correct response N = 94 % | Food Item | Correct response N = 94 % |
|---|---|---|---|
| Rice | 64.9 | Cow milk | 33.0 |
| Fat | 34.0 | White bread | 39.4 |
| Honey | 64.9 | Camel milk | 13.8 |
| Dates | 72.3 | Unsweetened fruit juice | 11.7 |
| Chicken | 85.1 | | |
| Potato | 43.6 | Green salad | 74.5 |
| Squash | 42.6 | Pasta | 42.6 |
| | | Whole wheat bread | 7.4 |

levels (carbohydrate-containing food). Non-starchy vegetables (e.g. green salad and squash), chicken, fat/oil, and meats were considered low in carbohydrate (i.e. less potential to increase blood glucose levels). Height and weight (without shoes) were measured using a calibrated scale with a stadiometer. Height was recorded to the nearest 0.5 cm and weight to the nearest 0.1 kg. Body mass index (BMI) was calculated using the standard method $(kg/m^2)$. Classification of underweight, healthy weight, overweight, and obesity were based on international BMI criteria (BMI: <18.5 $kg/m^2$, 18.5-24.9 $kg/m^2$, 25-29.9 $kg/m^2$, and ≥ 30 $kg/m^2$, respectively).[11] Data were analyzed using the Statistical Package for the Social Sciences, version 13.0 for Windows (SPSS, Chicago, U.S.A.). Descriptive statistics, t-tests, and chi-square tests were used. P-values < 0.05 were considered statistically significant.

## Results

### Demographic Characteristics

The demographic information of the 94 subjects who participated in the study is presented in Table 1. Participants in the study were 41 men (43.6%) and 53 women (56.4%); their ages were between 21- 80 years (mean age 50.1 ± 13.47). A high percentage (55%) of the participants had little or no formal schooling. The prevalence of overweight and obesity in the study subjects was 33% and 48%, respectively. This indicates that nearly 81% of the study subjects had excess body weight. These figures are in agreement with previous research which reported high prevalence of overweight and obesity in Emirati and Omani citizens[1,6,12] and show the necessity of intervention programs focusing on prevention and management of these conditions. Only 48 subjects (51%) reported following diet for diabetes management. Table 2 shows clinical parameters of the study sample. 30% of the subjects had diabetes for 1 year or less while 33% had diabetes for at least 10 years. The most common diabetes treatment used by the participants was oral hypoglycemic agents (65%).

### Diseases co-existing with diabetes

Diabetes often co-exists with other chronic diseases. 37% of the subjects in the study reported at least 2 of the following medical conditions hypertension, hyperlipidemia, heart disease. 17% of them had hyperlipidemia and 13% had hypertension. Only 21% of them had isolated diabetes. In addition to glycemic control, people with diabetes are advised to keep their blood cholesterol and blood pressure closer to healthy levels.
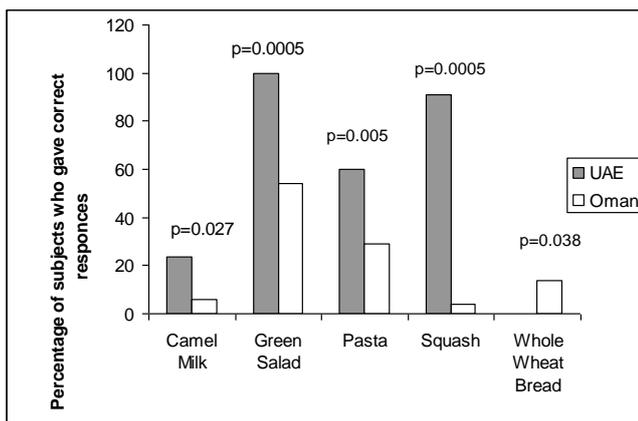
### Nutrition knowledge

Participants' knowledge of food sources of carbohydrate was low (mean score 6.3 out of 14). 88% of the subjects did not think that unsweetened fruit juice can increases blood levels because it has no added sugar. Similarly, 93% of them incorrectly thought that unlike white (refined) bread, whole wheat bread will not affect their blood sugar levels (Table 3). On the other hand, the majority of the participants correctly identified honey and dates to increase blood glucose levels (65% and 72%, respectively). Further, more participants thought that cows milk will affect their blood

glucose levels compared to camel milk (33% vs. 14%, respectively). Food items most of the subjects were able to correctly identify as having little effect on blood glucose levels were chicken and green salads (85 and 75%, respectively). When the nutrition knowledge of the Emirati and Omani citizens were compared, the values for the Omani citizens were significantly lower than those of Emirati counterparts, mean difference 2.3 (95% confidence interval:1.5-3.1).

A comparison of the individual scores for the food items between the two groups, showed significantly higher scores for Emirati citizens for the following food items: camel milk p=0.027, green salad p=0.0005, pasta p=0.005, and squash p=0.0005. The only food item Omani citizens had a significantly higher score was whole wheat bread (p=0.013) (Fig. 1).

Figure 2 shows sources of nutrition advice on diabetes management for the 48 subjects who reported they follow diet for diabetes management. As expected, the majority of them identified health professionals (doctors and dietitians) as the main source of nutrition advice (73%). Friends and



**Figure 1**: Carbohydrate-food knowledge scores which were significantly different between Emirati and Omani adults with diabetes
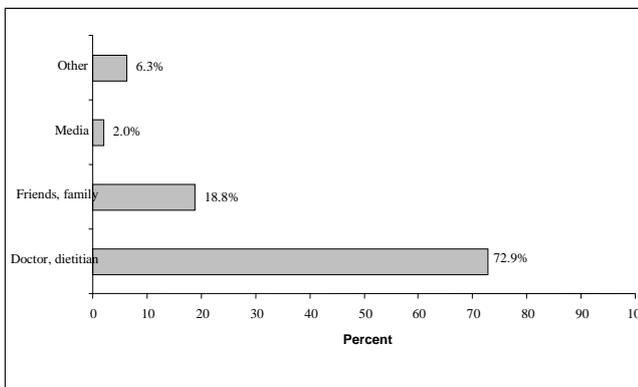


**Figure 2:** Sources of Nutrition advice on diabetes for the subjects who reported following diet for diabetes management (n=48).

family members (19%) were also important sources of nutrition information on diabetes management.

**Discussion**

Diabetes is a chronic disease that requires lifestyle changes involving diet and exercise. Education and communication to people with diabetes is important in improving knowledge, teaching skills, and influencing attitudes and behaviors. Research has shown a clear evidence of the role of lifestyle changes (healthy eating and physical activity) in the prevention and management of diabetes.[7,13,14] Carbohydrate-containing foods, fruits, milk, grain products (e.g. rice, bread, cereal, pasta ), concentrated sweets (e.g. sugar, honey, jams) and starchy vegetables (e.g. corn, potato, and peas) contain >5g of carbohydrate per serving and increase blood glucose levels. Therefore, knowledge of food sources and amount of carbohydrate intake is important for optimal glycemic control. Both the consistency in the amount of carbohydrate consumed and matching carbohydrate amount with insulin have been shown to improve blood glucose levels.[15-18]

It is clear from the findings of this survey that the people with diabetes need nutrition education programs. Given the low educational levels of many of the participants, recommended educational approaches for this group include using simplified meal planning systems to promote healthy eating, food sources and basic carbohydrate counting, as well as promoting weight management through healthy lifestyles. Using teaching aids, such as food models, food labels, and real foods will facilitate teaching clients the sources and amounts of carbohydrate in foods.

A large portion (73%) of the participants who reported to follow diet for diabetes management identified health care professionals (physicians and dietitians) as the main source of nutrition advice on diabetes management. However, in order to achieve the nutritional goals of diabetes management, a coordinated team effort that includes a series of visits to the dietitian for on-going assessment, education, and support is recommended.[19-21] Informal networks are an important source of nutrition information. 25% of the participants in this study reported family, friends and other social networks, including other people with diabetes, as a source of nutrition advice on diabetes management. In a previous study, 31% of Emirati women with diabetes identified informal networks, such as family members and neighbors as a source of nutrition advice.[22] However, it should be noted that information from informal networks can be a potential source of misinformation on diabetes care. Therefore, educational programs should include family members and other members of the person's social network to improve diabetes knowledge. Nutrition education interventions in family or household members have been shown to play an important role in improving diabetes knowledge and outcomes in persons with diabetes.[23]

Prevention and management of comorbidities, such as hypertension, and hyperlipidemia should be addressed. In addition to improving insulin sensitivity, lifestyle behaviors, such as healthy diet and regular physical activity, play an

important role in the prevention and management of these chronic conditions.

The main limitation of this study was that it involved a relatively small sample of volunteers. Despite these limitations, it provides us with an insight into the diabetes related nutrition knowledge of Emirati and Omani citizens and the results underscore the importance of nutrition education programs for persons with diabetes. The results of the study are useful in providing targeted nutrition advice to people with diabetes in these two countries. Further studies involving larger samples are needed to gain greater understanding of diet and diabetes self management behaviors including nutrition knowledge of individuals with diabetes in the UAE.

## References

1. Malik M, Bakir A, Abi Saab B, King H. Glucose intolerance and associated factors in the multi-ethnic population of the United Arab Emirates: Results of a national survey. Diabetes Research and Clinical Practice 2005; 69:188-195.
2. Al-Nuaim AR. Prevalence of glucose intolerance in urban and rural communities in Saudi Arabia. Diabetic Med 1997; 14: 595-602.
3. Al-Mahroos F, McKeigue PM. High prevalence of diabetes in Bahrainis. Associations with ethnicity and raised plasma cholesterol. Diabetes Care 1998; 2: 936-942.
4. Abdella N, Al Arouj M, Al Nakhi A, Al Assoussi A, Moussa M. Noninsulin-dependent diabetes in Kuwait: prevalence rates and associated risk factors. Diabetes Res Clin Pract 1998; 42 : 187-196.
5. Asfour M, Lambourne A, Soliman S, et al. High prevalence of Diabetes mellitusand impaired glucose tolerance in the Sultanate of Oman. Diab Med 1995; 12: 1122–1125.
6. Al -Lawati JA, Al Riyami AM, Mohammed AJ, Jousilahti P. Increasing prevalence of diabetes mellitus in Oman. Diabet Med 2002; 19: 954-957.
7. American Diabetes Assoc. Nutrition Recommendations and Interventions for Diabetes. Diabetes Care 2006; 29: 2006.
8. Franz MJ. Type 2 Diabetes-A Progressive Disease Requiring Progressive Treatment. On The Cutting Edge, Diabetes Care and Education Practice Group. American Dietetic Association 2004; 25: 8-13.
9. UK Prospective Diabetes Study Group. Intensive Blood-Glucose Control with Sulphonylureas or Insulin Compared with Conventional Treatment and Risk of Complications in Patients with Type 2 Diabetes (UKPDS 33). Lancet 1998; 352: 837-853.
10. Baltz JC. MNT strategies for achieving glycemic targets. On The Cutting Edge, Diabetes Care and Education Practice Group. American Dietetic Association 2004; 25: 13- 15.
11. National Heart, Lung and Blood Institute Executive summary of the clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. Arch Intern Med 1998;158: 1855-1867.
12. Carter A, Saadi H, Reed, R, Dunn, E. Assessment of Obesity, Lifestyle, and Reproductive Health Needs of Female Citizens of Al Ain, United Arab Emirates. J Health Pop Nutr 2004; 22: 75-83
13. Diabetes Program Prevention research Group: reduction in the incidence of type 2 diabetes with lifestyle intervention or Metformin N Eng J Med 2003; 346: 393-403.
14. Tuomilehto J, Lindstrom J, Eriksson JC, et al. for the prevention of the Finnish Diabetes Prevention Group (2001) Prevention of type 2 diabetes by changes in lifestyle among subjects with impaired glucose tolerance. N Eng J Med 2001; 344: 1343-1350.
15. American Diabetes Association Evidence-Based Nutrition Principles and Recommendation for the Treatment and Prevention of Diabetes and Related Complication. Diabetes Care 2002; 25: 202.
16. Arcudi K, Sherman S. Carbohydrate Counting Demystified: A Guide for General Practitioner. Canadian Diabetes 2005; 18: 3-4.
17. Canadian Diabetes Association. Basic Carbohydrate Counting for Diabetes Management. Canadian Diabetes Association, Toronto, 2005.
18. Nabata L, Caped S. Nutritional Management of Diabetes: Carbohydrate and Glycemic Control. Canadian Diabetes 2005; 18: 1-2.
19. Monk B, Barry K, McClain T, et al. Practice guidelines for medical nutrition therapy provided by dietitians for persons with non-insulin-dependent diabetes mellitus. J Am Diet Assoc 1995; 95: 999–1006.
20. American Diabetes Association, Gestational diabetes mellitus (Position Statement), Diabetes Care 2004; 27 (suppl 1): S88–S90.
21. Nutrition Practice Guidelines for Type I and Type II Diabetes Mellitus, American Dietetic Association, Chicago, Ill; 1996.
22. Ali, H, Miller CJ, Mohsen A, Dunn, EV, et al. Dietary fat reducing behaviors of Arab women with type 2 diabetes mellitus. Nutrition Research 2003; 23: 835-843.
23. Armour TA, Norris SL, Jack L Jr, et al. The effectiveness of family interventions in people with diabetes mellitus: a systematic review Diabetic Med 2005; 22: 1295–1305.