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ORIGINAL ARTICLE

Nutritional Related Lifestyle of Type 2 Diabetic Patients in Ahvaz-I.R.Iran

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The main objective of this study was to evaluate the nutritional related lifestyle patterns of newly-diagnosed type 2 Diabetes Mellitus patients in the City of Ahvaz, Iran.

Materials and Methods: One hundred and one type 2 Diabetic subjects who had been referred to the Ahvaz Diabetes Center completed the knowledge, attitude and practice (KAP), food frequency, lifestyle and anthropometric questionnaires in a cross – sectional study. Variables collected were socio-economic status, blood lipids and sugar levels, anthropometric indices, daily activity patterns, dietary habits, nutritional knowledge and medical histories. The percent of body fat (BF%) was measured using bioelectrical impedance analysis (BIA) method and obesity was defined according to this variable.

Results: Mean of the subjects' age was 52±9.6 years (67% female). Based on the BF%, more than 60% of women and about half of the men were overweight and / orobese. As a criterion for metabolic syndrome, 88.2% of women and 21.2% of men had abdominal obesity. Thirty-one percent of the subjects consumed hydrogenated fats, and 25% consumed dry fruits as sweeteners. Moreover, 69% of subjects had no information on starchy foods glycemic index. Half of the subjects were diagnosed as hypercholesterolemic, 57% had TG levels above the recommended levels, and 8 percent had hypertension.

Conclusion: The prevalence of overweight, central obesity, hypercholesterolemia, and hypertriglyceridemia in type II diabetic patients was high with trunk adiposity being more prevalent in females. Patients need to be educated on how to prevent this risk factors and healthier nutritional lifestyles.

Keywords: Type 2 Diabetes Mellitus, Lifestyle Patterns, Nutrition

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Introduction

Diabetes Mellitus is one of the most costly chronic diseases of our time with an increasing trend of epidemic proportions throughout the world.[1] The complications of this disease are significant causes of morbidity and mortality and are associated with the damage or failure of various organs such as the eyes, kidneys, and nerves. Individuals with type 2 diabetes are also at a higher risk for coronary heart disease, peripheral vascular disease, and stroke, and have a greater likelihood of developing hypertension, dyslipidemia, and obesity.[2,3] There is also growing evidence that at glucose levels above normal, but below the that of diagnostic threshold for diabetes, the risk of cardiovascular disease (CVD) and death increases substantially.[2,4,5]

According to epidemiologic studies, there are 1.5 million people with diabetes in Iran and about 14.5% to 22.5% of the population, aged 30 years and over, have impaired glu-

cose tolerance (IGT), of which one fifth are either at risk of macrovascular complications or are potential diabetics. Overall, 20% of the Iranian population, aged 30 years and over, are at risk of diabetes.[6,7]

The strategies known to be effective in preventing diabetes are based on lifestyle modification or glucose lowering drugs that have been approved for treating diabetes.[8] Since 1997, studies[9-11] have demonstrated the long-term effectiveness of weight loss and increased physical activity on diabetes prevention. In the Da Qing IGT and Diabetes Study[11] which followed three treatment groups for six years, researchers found that an appropriate diet plus exercise programs could reduce the risk of diabetes by 42 percent compared with the control group.

In two well-controlled studies that included lifestyle interventions, substantial efforts were necessary to achieve only modest changes in weight and exercise, but those changes were sufficient enough to achieve an important reduction in the incidence of diabetes.[12,13] In the Diabetes Prevention Program (DPP),[14] the lifestyle group lost about 12 lb in 2 years and 9 lb in 3 years (mean weight loss for the study duration was about 12 lb or 6% of initial body weight). In both of these studies, most of the participants were obese (BMI >30 kg/m²). Although in both studies, diabetes could be delayed or prevented with only modest changes in weight and activity, considerable efforts of well-trained staff were needed to achieve these behavioral changes.

On the other hand, because there is strong epidemiologic evidence that physical activity and weight loss are of medical benefit, not only for preventing diabetes, but also for improving cardiovascular health and quality of life,[15,16] health care policymakers and health care systems should continuously explore cost effective ways to promote physical activity and weight loss as a major intervention for lifestyles changes.

Hypertension is a major risk factor for cardiovascular events and contributes significantly to the macro and micro vascular complications of diabetes.[17-19] The Sixth Report of the Joint National Committee on Prevention, Detection Evaluation and Treatment of High Blood Pressure[20] recommends modest weight loss and moderately intensive physical activity with and without medications for treatment of hypertension. The effectivity of modest weight loss and moderately intense physical activity on blood pressure control in hypertensive adults is supported by data from two recent meta-analyses.[21,22]

Observational studies suggest that patients who report healthier diets and greater physical activity have fewer cardiovascular events.[23,24] The American Diabetes Association has made recommendations for both medical nutrition therapy (MNT)[23] and physical activity.[24] Weight loss and increased physical activity leads to decreased triglycerides and increased HDL cholesterol levels and to modest lowering of LDL cholesterol levels. Patients with diabetes who are overweight should be prescribed MNT and increased physical activity.[25]

Considering the lack of related data, and the increasing trend of diabetes in Iran, the main objective of the present study was to evaluate the lifestyles and nutritional patterns of type 2 diabetes patients in the city of Ahvaz, one of the five largest cities of Iran.

Materials & Methods

Subjects: In this study, 101 newly-diagnosed type 2 diabetics who had been referred by their physicians to the Ahvaz Diabetes Center were assessed in a cross-sectional design during autumn and winter, 2003. These patients were aged 38-67 years and were randomly selected from a list of 215 subjects. Most of them were on oral hypoglycemic agent regimens. Patients were interviewed by the senior trained nutrition students.

Variables: Information on patients' knowledge, attitude, and practice (KAP) regarding diabetic diet, lifestyle patterns including dietary practices was obtained using food histo-

ries and frequency questionnaires; usual physical activity, diet, smoking habits, and stress status were recorded. Anthropometric indices including weight and height were measured without shoes using Seca® digital platform scale, Germany, and a non-stretchable wall meter. Body mass index (BMI), and waist to height ratio were calculated. Subjects' body fat percent (BF%) was determined by hand-to-hand Omron® BF-302 set, Japan, with standard errors of estimate (accuracy) of 4.1%. Validity of Omron BF-300 (another set which is very similar to BF-302) against the Siri equation was determined through technical error by Moreno et. al.(26). They showed that this monitor satisfies the intra-class correlation coefficient (ICC) and and the precision criteria (ICC > 0.95 and low CV) and validation (excellent technical error, ICC > 0.75 and clinically acceptable differences) and is a valid alternative to cutaneous folds as a method of assessing nutrition of the subjects. BF% over 35% was regarded as the cut-off point of obesity.[27,28]

Clinical signs and biochemical profiles were assessed by a GP. Serum lipid profiles and fasting blood sugar (FBS) concentrations were measured at the university reference laboratory. Abdominal obesity was defined based on NHLBI criteria[29] in which wais circumference (WC) above 88 cm for females and above 102 cm for males are considered as one of the cut-off points for metabolic syndrome.

Statistics: Data were analyzed by the student t, ANOVA and chi-square tests using SPSS soft-ware version # 11.5. P value less than.05 was regarded as significant.

Results

Subjects were 52 ± 9.6 years old, and 67% of them were female. Sixty-eight percent of females and 42% of males had primary education levels (p=0.05). Based on the body fat monitoring, more than 60% of women and about one half of men were overweight and/or obese. Prevalence of abdominal obesity in females was about four times higher than that of males (88.2% vs. 21.2%). Waist to height ratio (as a new criterion) and percent body fat of females were high, while their BMIs were within normal ranges. Anthropometric and clinical indices of the subjects are presented in Table 1.

Table 1. Anthropometric and clinical characteristics of type 2 diabetic patients*

Criteria	Men (n=33)	Women (n=68)	P
Body fat (%)	25.3±5.8	35±6.6	0.001
Waist circumference (Cm)	95.3±8.9	99.9±10	0.04
Waist to Height Ratio	0.57±0.06	0.62±0.06	0.03
BMI (Kg/m²)	21.4±3.2	22.2±2.9	0.16
SBP (mm Hg)	124.2±14.8	122±15.4	0.52
DBP (mm Hg)	75.4±8.3	73.7±14.8	0.53

*Values are Mean±SD; BMI: Body mass index; SBP: Systolic blood pressure; DBP: Diastolic blood pressure.

Thirty-one percent of the subjects used to consume hydrogenated fats, and twenty percent of them had been consuming full-fat dairy products. Moreover, twenty-five percent of patients ate dry fruits (e.g. dates and dried figs) instead of sugar as sweeteners, and 17% used artificial sweeteners. Seventy-six percent used to eat fish on a weekly basis, while 72% rarely had shrimp. Only 4% had 3-5 servings of red meat a day. Seventy-eight percent of the subjects were eating vegetables daily, of which only 5% met the Food Guide Pyramid recommendations (i.e., 3-5 servings of vegetables daily). Moreover, forty percent of them used to eat 3-5 servings of fruits on a daily basis. None of them consumed butter regularly. Female patients had more red meat than males ($p<0.01$). However, frequent tea drinking was more common in male patients than in females ($p=0.013$). There were no significant differences in the other dietary practices between the two sexes (table 2).

There was a three-fold difference between men and women in smoking habits ($P<0.02$; table 3). Moreover, female patients reported being 3 times more stressed than men most of the time ($p=0.01$). Frequent usage of herbal extracts was more prevalent in women than in men (34% of females vs. 18% of males,

Table 2- Daily consumption of food groups in type 2 diabetic patients based on the food guide pyramid and the mediterranean food pyramid

Food groups	Females (n=68)		Males (n=33)		P
	n	%	n	%	
Full-fat milk	27	40	13	39	0.63
Chicken	27	40	12	36	0.55
Fish*	28	41	20	61	0.33
Red Meat	28	41	8	24	0.01
Breads	61	90	27	82	0.32
Fresh fruits	27	40	13	39	0.57
Fresh vegetables	5	7	0	0	0.00
Drinking tea	42	62	30	91	0.013
Vegetable Oils	42	62	15	45	0.36
Hydrogenated fat	25	37	16	48	0.1

Data were pooled from FFQ.
* Fish consumption was based on weekly pattern.

Table 3- Some habitual and lifestyle features of type 2 diabetic patients.

Criteria	Women (n=68)		Men (n=33)		P
	n	%	n	%	
Exercise habit	26	38	15	45	0.32
Daily walking	37	54	23	70	0.12
Smoking habit	6	9	9	27	0.02
Herbal medicine usage	23	34	6	18	0.08
Taking weight loss diets	36	53	19	58	0.41
Natural sweeteners usage	16	24	9	27	0.09
Artificial sweeteners usage	16	24	11	33	0.41
Salt consumed only at cooking time	56	82	28	85	0.39
Emotionally stressed most of time	39	47	5	15	0.01

p=0.08). Based on the subjects' nutritional knowledge, half of the patients had no information about the glycemic index of starchy foods consumed.

According to subjects medical histories, 31% of the patients had cardiovascular diseases including history of unstable angina, myocardial infarction (MI), and ischemic heart disease. Half of the subjects had cholesterol levels over 200 mg/dL, 57% had triglyceride concentrations above 150 mg/dL. Totally, eight percent were diagnosed as hypertensive. Patients limited their salt consumption to that used for their food preparation, adding no salt shile eating.

Discussion

In the present study, it was shown that the prevalence of overweight, obesity, and central adiposity was high in diabetic patients, and complications were more severe in females. Moreover, we presented two new criteria. First, obesity was defined based on BF%, because it had a more scientific base rather than BMI or body fat per se.[30,31] Secondly, waist-to-height ratio was used as a new criterion for central obesity and risk of diabetes.[32]

Both the Finish Diabetes Study[12] and the DDP study[10] have emphasized lifestyle modification, mainly the weight reduction strategy in diabetic patients. Moreover, usual physical activity was rarely seen in a majority of the individuals. Many studies have focused on improvement of physical activities, although in some of them the goal was not successfully actieved.[10,12] The Malmo study[9] had previously found that a weight loss of 2.3-3.7% over 6 years normalized glucose tolerance in >50% of subjects with impaired glucose tolerance (IGT) and resulted in remission in >50% of people with type 2 diabetes.

Compared with the American Food Guide Pyramid, our results showed that female patients consumed more red meat than males.

Only seven percent of diabetic females used to have 3-5 exchanges of vegetables in their daily food pattern. None of the male patients had vegetables daily. Vegetables are a good source of dietary fibers, carotenoids, antioxidants and diabetic patients need more of these active dietary components in their daily menus.

Ninety-one percent of diabetic men compared with 62 percent of women used to drink 3-5 cups of tea daily, which is a good drink containing antioxidant flavonoids,. Diabetic females tend to have more traditional herbal drinks than males. There is a cultural interest for traditional medicine in Iran and it deserves more precise investigations to explore the metabolic effects. Male diabetic patients used to smoke three times more than females (27 vs. 9 percent). On the other hand, the number of women who reported suffering emotional stress was three times more than men (47 vs. 15 percent).

Weekly exercise and daily habitual activities were more prevalent in males than females, although not significant. However, regular physical activity is recommended for diabetic patients because weight loss and physical activity decrease insulin resistance, improve glucose tolerance and glycemic control, lower blood pressure, and reduce risk of cardiovascular disease in these patients.[30-33] In the Finnish study, weight loss averaged 9.2 lb at 1 year, 7.7 lb after 2 years, and 4.6 lb after 5 years[12] the exercise component of the intervention called for "moderate exercise" of 30 min/day. Pan et. al.[11] randomly assigned a large group of men and women by clinics to either a control group or one of three treatments: diet, exercise, or diet plus exercise (as the main features of their lifestyle pattern). The results of this 6-year study showed that the diet, exercise, and diet-plus-exercise interventions were associated with 31, 46, and 42% reductions in the risk of developing diabetes, respectively. Thirty one percent of our patients at least had one complication of cardiovascular disease (CVD) such as history of MI, chronic hypertension, and unstable angina. These co-morbidities have been men-

tioned as diabetes outcomes by other authors[32-35]

About 60% of adults with diabetes have comorbid hypertension,[17,18] and data suggest that when diabetes and hypertension coexist, the risk for cardiovascular events doubles.[19] However, it was encouraging that more than 80% of our patients were aware of excess salt intake and the salt consumed by them was only that used at food preparation; no salt was added while eating.

Both central obesity and high serum triglyceride levels are regarded as key criteria in metabolic syndrome[29] These symptoms were seen in both sexes (especially in females). Moreover, low serum HDL-C concentrations were detected in a majority of our patients (data not shown here).

In conclusion, it was observed that half of the patients are overweight and / orobese and central adiposity is prevalent in a majority, especially in females. Consumption of hydrogenated fats, low nutritional information, and hyperlipidemia were among most important nutritional issues which need to be addressed.

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References

1. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. Diabetes Care 1998; 21: 1414-31.
2. Reaven GM. Banting lecture 1988. Role of insulin resistance in human disease. Diabetes 1988; 37: 1595-607.
3. Eastman RC, Cowie CC, Harris MI. Undiagnosed diabetes or impaired glucose tolerance and cardiovascular risk. Diabetes Care 1997; 20: 127-8.
4. Saydah SH, Loria CM, Eberhardt MS, Brancati FL. Subclinical states of glucose intolerance and risk of death in the U.S. Diabetes Care 2001; 24: 447-53.
5. Bjornholt JV, Erikssen G, Aaser E, Sandvik L, Nitter-Hauge S, Jervell J, et al. Fasting blood glucose: an underestimated risk factor for cardiovascular death. Results from a 22-year follow-up of healthy nondiabetic men. Diabetes Care 1999; 22: 45-9.
6. Azizi F, Guoya MM, Vazirian P, Dolatshati P, Habbibian S. Screening for type 2 diabetes in the Iranian national programme: a preliminary report. East Mediterr Health J 2003; 9: 1122-7.
7. Azizi F. Diabetes in the Islamic Republic of Iran. IDF Bulletin 1996; 41: 38-9.
8. American Diabetes Association, National Institute of Diabetes and Digestive and Kidney Diseases. The Prevention or Delay of Type 2 Diabetes. Diabetes Spectrum 2002; 15: 147-57.
9. Eriksson KF, Lindgarde F. Prevention of type 2 (non-insulin-dependent) diabetes mellitus by diet and physical exercise. The 6-year Malmo feasibility study. Diabetologia 1991; 34: 891-8.
10. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, et al; Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med 2002; 346: 393-403.
11. Pan XR, Li GW, Hu YH, Wang JX, Yang WY, An ZX, et al. Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and Diabetes Study. Diabetes Care 1997; 20: 537-44.
12. Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Ilanne-Parikka P, et al; Finnish Diabetes Prevention Study Group. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med 2001; 344: 1343-50.
13. American Diabetes Association. Type 2 diabetes in children and adolescents. Diabetes Care 2000; 23: 381-9.
14. American Diabetes Association. The Diabetes Prevention Program: Design and methods for a clinical trial in the prevention in type 2 diabetes. Diabetes Care 1999; 22:623-34.
15. National Institutes of Health. Clinical Guidelines on the Identification, Evaluation, and Treatment of

Overweight and Obesity in Adults--The Evidence Report. Obes Res 1998; 6 Suppl 2: 51S-209S.
16. Physical activity and cardiovascular health. NIH Consensus Development Panel on Physical Activity and Cardiovascular Health. JAMA 1996; 276: 241-6.
17. Arauz-Pacheco C, Parrott MA, Raskin P. The treatment of hypertension in adult patients with diabetes. Diabetes Care 2002; 25: 134-47.
18. Egede LE, Zheng D. Modifiable cardiovascular risk factors in adults with diabetes: prevalence and missed opportunities for physician counseling. Arch Intern Med 2002; 162: 427-33.
19. Grossman E, Messerli FH, Goldbourt U. High blood pressure and diabetes mellitus: are all antihypertensive drugs created equal? Arch Intern Med 2000; 160: 2447-52.
20. The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: The sixth report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Arch Intern Med 1997; 157: 2413-6.
21. Mulrow CD, Chiquette E, Angel L, Cornell J, Summerbell C, Anagnostelis B, et al. Dieting to reduce body weight for controlling hypertension in adults. Nurs Times 2001; 97: 42.
22. Whelton SP, Chin A, Xin X, He J. Effect of aerobic exercise on blood pressure: a meta-analysis of randomized, controlled trials. Ann Intern Med. 2002; 136: 493-503.
23. Franz MJ, Bantle JP, Beebe CA, Brunzell JD, Chiasson JL, Garg A, et al; American Diabetes Association. Nutrition principles and recommendations in diabetes. Diabetes Care 2004;27 Suppl 1: S36-46.
24. Zinman B, Ruderman N, Campaigne BN, Devlin JT, Schneider SH; American Diabetes Association. Physical activity/exercise and diabetes. Diabetes Care. 2004; 27 Suppl 1: S58-62.
25. Haffner SM; American Diabetes Association. Dyslipidemia management in adults with diabetes. Diabetes Care 2004; 27 Suppl 1: S68-71.
26. Martin Moreno V, Gomez Gandoy B, Antoranz Gonzalez M, Fernandez Herranz S, Gomez De La Camara A, de Oya Otero M. Validation of the OMRON BF 300 monitor for measuring body fat by bioelectric impedance. Aten Primaria. 2001; 28: 174-81.
27. Deurenberg P, Yap M. The assessment of obesity: methods for measuring body fat and global prevalence of obesity. Baillieres Best Pract Res Clin Endocrinol Metab 1999; 13: 1-11.
28. Deurenberg P, Yap M, van Staveren WA. Body mass index and percent body fat: a meta analysis among different ethnic groups. Int J Obes Relat Metab Disord 1998; 22: 1164-71.
29. NHLBI. Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adults Treatment Panel III). May 17; 2001. Available at: http://www.nhlbi.nih.gov/guidelines/cholesterol/ atglance.htm
30. National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. Circulation 2002; 106: 3143-421.
31. Amani R. Comparison between bioelectrical impedance analysis and body mass index methods in determination of obesity prevalence in Ahvazi women. Eur J Clin Nutr Oct 2006; doi:10.1038/sj.ejcn.1602545.
32. Hadaegh F, Zabetian A, Harati H, Azizi F. Waist/height ratio as a better predictor of type 2 diabetes compared to body mass index in Tehranian adult men--a 3.6-year prospective study. Exp Clin Endocrinol Diabetes 2006; 114: 310-5.
33. Wee CC, McCarthy EP, Davis RB, Phillips RS. Physician counseling about exercise. JAMA 1999; 282: 1583-8.
34. Expert Panel on the Identification, Evaluation, and Treatment of Overweight in Adults: Clinical Guidelines on the Identification, Evaluation, and Treatment Overweight and Obesity in Adults: exexecutive summary. Am J Clin Nutr 1998; 68:899-917.
35. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: executive summary. Expert Panel on the Identification, Evaluation, and Treatment of Overweight in Adults. Am J Clin Nutr 1998; 68: 899-917.
36. U.S. Department of Health and Human Services: Physical Activity and Health: a Report of the Surgeon General. Atlanta, Ga., U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; 1996.
37. Fuller JH, Shipley MJ, Rose G, Jarrett RJ, Keen H. Mortality from coronary heart disease and stroke in relation to degree of glycaemia: the Whitehall study. Br Med J (Clin Res Ed) 1983; 287: 867-70.