Mediterranean Diet Sharply Reduces Diabetes Risk

Two trials show virgin olive oil 'protects against insulin resistance and the metabolic syndrome.'

BY JONATHAN GARDNER
London Bureau

A Mediterranean diet high in vegetables, fruits, and cereal grains and low in meat can significantly reduce the risk of diabetes in initially healthy people, according to a large Spanish cohort study published online in BMJ.

In a median of 4 years of follow-up with more than 13,000 Spanish university graduates without diabetes at baseline, researchers from the University of Navarra, Pamplona, found that those with food intake at baseline that conformed strongly with a Mediterranean diet had an adjusted 0.17 incidence rate ratio of type 2 diabetes, compared with those whose diet scored poorly on the 9-point dietary index. Those with a moderate Mediterranean diet score had an adjusted 0.4 incidence rate ratio of diabetes, compared with those who scored poorly.

Rich in vegetables, fruits, cereal grains, legumes, fish, and olive oil, and low in meat intake, a Mediterranean diet has, in previous studies, been found to be protective against coronary death. It also has been associated with a reduction in diabetes incidence among patients who have survived myocardial infarctions, the researchers noted.

"Two trials have shown that virgin olive oil protects against insulin resistance and the metabolic syndrome," wrote the researchers, led by Dr. Miguel Ángel Martínez-González, chairman of the department of preventive medicine and public health at the university.

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A Mediterranean diet is high in essential fatty acids and includes fish, olive oil, fruits, vegetables, legumes, and grains.

"Apart from olive oil, adherence to an overall Mediterranean-type food pattern is related to lower plasma concentrations of inflammatory markers and markers of endothelial dysfunction. These biomarkers are predictive of the future occurrence of type 2 diabetes," the researchers wrote.

Researchers recruited university graduates and registered nurses to enroll in a long-term prospective cohort study beginning in December 1999. Of the enrollees, 13,380 had completed at least a 4-year follow-up questionnaire and did not report cardiovascular disease or diabetes at baseline (BMJ 2008 [Epub doi:10.1136/bmj.39561.501007.BE]).

The researchers assessed enrollees' dietary habits at baseline using a food frequency questionnaire with 136 items. Adherence to the diet was based on a score that added a point for every item of protective food that was consumed over the median and a point for every item of nonprotective food that was consumed under the median, researchers said. High scores were those between 7 and 9 and moderate scores were between 3 and 6.

At baseline, those scoring highest also had the highest mean body mass index, the greatest percentage with a family history of diabetes, and the largest percentage of members with hypertension, the researchers said.

In 4 years of follow-up, there were 33 confirmed cases of new onset diabetes in 58,918 person-years, according to the researchers. Unadjusted cumulative incidence rates were 0.4% in the low-scoring group, 0.23% in the moderate-score group, and 0.13% in the high-scoring group, the researchers said.

The small number of diabetes cases may have limited the statistical power of the study, the researchers acknowledge, although they add that the cohort is a young one (mean age 37.8 years) in which diabetes onset is less likely.

They added that the higher educational levels and high absolute consumption of favorable foods in the cohort may make its findings difficult to generalize either to people with less education or to non-Mediterranean countries in which consumption rates of the favorable foods are much lower. Additional trials and cohorts may be necessary to confirm their findings, the researchers wrote. ■

Insulin Orders and Algorithm Improve Glycemic Control

BY MARY JO M. DALES
Editorial Director

SAN DIEGO — Insulin-use patterns and glycemic control improved, while episodes of hypoglycemia declined, among non–critical care patients with diabetes after structured insulin orders and an insulin management algorithm were added to the hospital order set at the University of California, San Diego Medical Center.

After the structured insulin order set was added, the relative risk of an inpatient stay decreased to 0.84 when the mean blood glucose level was greater than 180 mg/dL. With the order set plus the algorithm in place, the relative risks of an uncontrolled patient day and an uncontrolled patient stay declined to 0.77 and to 0.73, respectively. Furthermore, the relative risks of hypoglycemia per patient day and patient stay declined to 0.80 and 0.92, respectively, and the percentage of patient days with hypoglycemia decreased from 3.7% to 2.6%.

The findings are based on data from more than 5,500 subjects who had at least seven glucose measures during stays at the UCSD center. Data were compared for the year before the institution of the order set, for 18 months after introduction of the order set alone, and for the subsequent 8 months after the algorithm was added to the order set.

The success of the order set and the one-page algorithm—which recommended treatment pathways for adult medical and surgical inpatients who had a diagnosis of diabetes or documented hyperglycemia—were reported at the annual meeting of the Society of Hospital Medicine by Dr. Greg Maynard, chief of the division of hospital medicine at UCSD. The pathways were tailored to whether inpatients were receiving regular meals, were under NPO (nothing by mouth) orders, or were tube fed.

The outcomes were a "win-win situation," he said. The "chaotic swings" in glycemia seen before the order set was instituted gave way to better control, and no special team was needed to get the results. He attributed most of the good results to a shift to basal/bolus insulin regimens from sliding-scale insulin regimens. After the order set and algorithm were instituted, sliding-scale-only insulin regimens decreased from 72% of 477 insulin regimens to 26% of 499 insulin regimens.

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The next step for inpatient diabetes research, according to Dr. Maynard, is to develop reaction and prevention protocols. Suboptimal response to episodes of hyper- and hypoglycemia is the norm in hospitals, he said. "We don't take action when it should be taken, and opportunities to prevent hypoglycemia are missed."

As an example, Dr. Maynard discussed the results of a study published last year. Within 48 hours after they were given an antihyperglycemic agent, 10% of 2,174 hospitalized patients with diabetes had hypoglycemia. Of those 206 patients, 44% had more than one hypoglycemic event. No adverse events accompanied 464 of the hypoglycemic episodes; there were 20 adverse events and 10 of these resulted in seizures or loss of consciousness. None of the adverse events was attributable to medication errors, and just 11% of the patients were on oral-only regimens.

About half of the hypoglycemic events were associated with reductions in enteral intake, but the precipitating factors were unclear in the other half. Just one-third of patients had their blood glucose rechecked within 60 minutes and fewer than half had documented euglycemia within 2 hours of their hypoglycemia; the average time to a documented resolution was 4 hours (J. Hosp. Med. 2007;2:234-40).

Dr. Maynard also advised examining patients' outpatient diabetes regimens, and imparted some recommendations for transitioning patients at hospital discharge.

The patient who was taking metformin and was admitted with a hemoglobin A_{1c} level greater than 9% and a baseline glucose measure of more than 350 mg/dL clearly needs her regimen adjusted, he said. But any recommendations need to consider her physical limitations; any new comorbidities; her willingness and ability to self-monitor; treatment goals; hypoglycemia risk factors; and the patient's financial situation. "You're not going to shoot for [a blood glucose level of] 110 mg/dL in a hospice patient, or encourage self-monitoring four times per day in a patient who can't afford it or is unwilling to do the tests," he said. Those considerations weigh into treatment selection.

Dr. Maynard offered the following general observations to consider when you select a discharge therapy.

- ► Once HbA_{1c} exceeds 8.5%, additional oral agents are unlikely to achieve goals.
- ► Insulin at bedtime is a good initial strategy.
- ► Testing drives the cost of therapy. Testing four times per day is more expensive than insulin.
- ► Elderly patients are at higher risk for hypoglycemia. Decrease their insulin as they get better, and make sure they have good follow-up and aren't being overtreated.
- ► Glyburide has been linked with a higher risk of hypoglycemia than has glipizide.
- ► The evidence on risk factors is imperfect, but be hesitant to start glitazones de novo.

As a treatment reference, Dr. Maynard suggested algorithms available at the Web site of the American Academy of Clinical Endocrinologists (www.aace.com/resources/igcrc) and the Society of Hospital Medicine (www. hospitalmedicine.org/ResourceRoomRedesign/GlycemicControl.cfm).

Dr. Maynard reported that he and his coinvestigators had no disclosures related to the study. ■

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