

## Too much sugar may cause “brain decay”

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It is well known that too much sugar causes tooth decay, but might it also cause “brain decay?” Recent research suggests that it just might. With the growing epidemic of obesity in the US, the number of people with diabetes is also increasing. Diabetes is due to the body’s inability to maintain a constant level of sugar in the blood, as it should. Over time, this results in problems in many parts of the body, including the kidneys, heart, muscles, nerves and brain. People with diabetes are more likely to have a heart attack or stroke at a younger age. In addition, they may be at a greater risk for a decline in mental function—brain decay—or dementia. Fortunately, improving eating habits and avoiding excessive weight gain may prevent many cases of diabetes.

In the current issue of *Neurology*, Yaffe et al.<sup>1</sup> discuss the risks of mental decline in women with diabetes and “pre-diabetes.” Both diabetes and dementia are more common in the elderly. But are problems with regulation of blood sugar and decline in mental functions related? If so, the authors predict that older people with early problems with blood sugar regulation might also show early signs of impaired thinking.

Yaffe et al. collected information from 7,027 elderly women who had gone through menopause and were being followed for four years to study the effect of a medication to treat osteoporosis (a condition that causes bones to thin, with increased risk of breaking). At the beginning of the study, the women were tested for various health conditions, including diabetes and pre-diabetes. Pre-diabetes was noted if

there was a mild increase in blood sugar when the woman had fasted overnight, called “impaired fasting glucose.” The women were also given tests to look at their verbal memory, attention, and other types of thinking. These cognitive tests were repeated each year for the four years of the study. Women with the worst 10% of scores were sent to specialists to be evaluated for dementia. If dementia was found, they were referred for a brain CT or MRI scan to look for brain abnormalities and special laboratory tests (see page 2, “About dementia”).

Of the 7,027 women in the study, 267 (3.8%) were classified as having diabetes and 297 (4.2%) as having impaired fasting glucose (pre-diabetes). At the start of the study, women with diabetes had the lowest scores on the tests of mental function. Women with pre-diabetes had worse scores than women with normal blood sugar, but better scores than those with diabetes. It was also noted that women with diabetes and pre-diabetes tended to be older, less educated, less likely to be white, and more likely to have had a heart attack. These women also tended to have a higher body mass index, which is calculated from height and weight.

Women with diabetes had greater decline in mental function over four years than women without diabetes. By the end of the four-year study, 5.9% of the women with normal blood sugar regulation developed significant decline in mental function as compared with 10.1% of women with pre-diabetes, and 12.1% of those with diabetes. Women with pre-diabetes tended to have cognitive scores and rates of decline intermediate

between women with diabetes and women without diabetes. Risk of developing cognitive impairment among women with pre-diabetes or diabetes is almost twice the risk for women with normal blood sugar.

From these results, Yaffe et al.<sup>1</sup> conclude that abnormal regulation of blood sugar is linked to an increased risk of developing cognitive impairment and dementia in elderly women. There may be several reasons why diabetes may cause cognitive impairment. One is that typical complications of diabetes such as kidney disease, stroke, high blood pressure, high levels of fat in the blood, and heart disease may lead to poor mental performance. Another possibility is that high levels of blood sugar over an extended time may cause direct damage to nerve cells due to accumulations of certain end-products. Nerve cell damage might also be caused indirectly by damage to small and large blood vessels in the brain due to atherosclerosis (deposits of fatty materials which clog the blood vessels). Finally, another recent study showed that levels of an enzyme that helps to break down sugar in the body is reduced in patients with Alzheimer dementia.

The observation that mental decline is more severe in elderly women with pre-diabetes than in those with normal blood sugar, and even more severe in diabetic women, supports a link between blood sugar regulation and cognitive function. Further studies are needed to see if early treatment of abnormal blood sugar regulation can help to prevent mental decline. However, improving eating habits and avoiding excessive weight gain may, at least, prevent many cases of diabetes.

### **What is dementia?**

Dementia is a decline in mental functions that generally includes short and long-term memory, and is often associated with changes in language, logical thinking and personality. It persists over time, but in some specific cases it may be reversible. It interferes with job performance, relationships and eventually basic elements of self-care. Dementia tends to occur late in life, affecting about 1% at the age of 60, and increasing to over 35% by the age of 85.

### **Are all dementias the same?**

No— there are several different types of dementia that vary by location within the brain and have widely different causes. In the early stages, signs of the disorder may be quite different and need early attention, because different types of treatment may be possible. The most common form of dementia is Alzheimer disease. Other common varieties include the vascular dementias, which are associated with strokes. Vascular dementias have various symptoms depending on whether the patient suffers large or small, single or multiple strokes, and what parts of the brain are injured. Vascular dementias are most common in people with high blood pressure and diabetes. Another type of dementia that is becoming better recognized is called Dementia with Lewy Bodies. In this form, there are problems with gait and balance, fluctuations in alertness and mental functions, hallucinations and delusions, falls, and episodes of unresponsiveness. Other varieties of dementia include those that involve the frontal lobes (the front part of the brain). In these dementias, personality changes, poor judgment, inappropriate behaviors, and lack of goal setting and planning are typical. Other forms of dementia are associated with diseases such as HIV/AIDS, Parkinson disease, and various rare infectious diseases, including a variant of Mad Cow disease.

### **Which dementias may be reversible?**

Less than 10% of dementias may be fully reversible, but these should always be considered. The most common are those that involve thyroid disease and low vitamin B12 levels, which may be detected with simple laboratory tests. Depression is common in the elderly and often associated with dementia. Treatment of depression may improve some signs of mental impairment. Previous infection with syphilis may occasionally be associated with dementia and should be tested if there are specific risk factors or evidence of prior infection. Another potentially reversible cause of dementia is “normal-pressure hydrocephalus” which is characterized by problems with gait, urinary incontinence and mental decline. A surgical procedure may reverse symptoms if treated early enough. Other diseases, infections, and even head injury may be associated with cognitive impairment and may be found by blood tests or brain imaging studies (e.g., CT or MRI scans). Correction or treatment of these underlying causes may lead to improvement in mental function.

### **What are the warning signs?**

Patients rarely seek medical help for their symptoms because they are often unaware that there is a problem. This lack of insight is a common feature of the early stages of dementia. Sometimes families do not act either because they think the behaviors are a normal part of getting older. Problems with remembering recent events, such as whether or not a patient ate breakfast or took his or her medications, may occur in the early stages. Patients with early dementia may misplace personal belongings and accuse others of “stealing” them; or they may have difficulty finding words or names. Changes in behavior may also be common, with increased irritabil-

ity and defensiveness, especially when family members suggest that they may need medical help. Lack of attention to personal hygiene and dressing, and loss of interest in previous activities or hobbies may be warning signs. Behaviors that had previously been present may worsen to become socially inappropriate and suggest that a medical checkup is needed.

### **What should you do if you suspect dementia in a loved one?**

Early diagnosis is key. It is critical to seek medical attention if you recognize or suspect symptoms of dementia. Routine laboratory testing may detect reversible causes of dementia. The patient may be referred to a doctor who specializes in dementia for further evaluation and treatment. Early treatments may help to slow the progression of some of the progressive dementias, such as Alzheimer disease. There are also changes that can be made in the patient’s environment as well as medications that may help treat some of the behavioral problems. The more the caregivers can learn about the dementia process and how to manage it, the longer the patient may be able to remain at home. Support systems include adult day care programs, computer and telephone support groups, and other respite programs. Research efforts should be supported to further the understanding, treatment, and prevention of dementias.

### **Other resources**

American Academy of Neurology Foundation  
[www.thebrainmatters.org](http://www.thebrainmatters.org)  
Alzheimer’s Association  
[www.alz.org](http://www.alz.org)

### **Reference**

1. Yaffe K, Blackwell T, Kanaya AM, et al. Diabetes, impaired fasting glucose and development of cognitive impairment in older women. *Neurology* 2004;63:658–663.