

# Diabetes mellitus type 2



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## **Research Paper Related to Prevention of Diabetes Mellitus Type 2**

Beginning in the 1990's, the number of cases of Diabetes Mellitus Type 2 (DMT2) began increasing.

This increase occurred alongside an increase in obesity, poor diet choices, and a decrease in exercise among the American population. DMT2 is the most common form of diabetes and is particularly affecting the younger population. With one in five children now said to be overweight, some studies indicate that the number of young people with DMT2 has quadrupled in recent years. This paper will examine the complexity of DMT2 and its rising incidence among the United States (US) population as well as demonstrate that community education and prevention are key components to controlling this disease (American Diabetes Association, 2007). It will consider six dimensions: 1) pathophysiology, 2) incidence and prevalence, 3) audience, 4) survey and other research, 5) disease prevention, and 6) teaching plan with final conclusions.

### **Dimension One: Pathophysiology**

DMT2 is a chronic disease previously called non-insulin-dependent diabetes mellitus or adult-onset diabetes. It is caused by several complex metabolic disorders which can lead to high levels of sugar in the blood. These disorders result from defects of multiple organ sites including insulin resistance in muscles and tissues, a decline in insulin secretion from the pancreas, unrestrained hepatic glucose production or secretion, and/or declining  $\beta$ -cell function. Patients who have DMT2 are not able to regulate the glucose levels in the body. If glucose is not able to reach cells in the body, the body is not

able to use it for energy and the glucose will stay in the blood causing the main symptoms of diabetes (Barr, Myslinksi, & Scarborough, 2008).

$\beta$ -cell dysfunction is thought to be partly genetic and contributes to the onset of glucose intolerance in DMT2. It is characterized by impairment in the first phase of insulin secretion during glucose stimulation. The endocrine pancreas is unable to compensate for insulin resistance that could lead to hyperglycemia and the onset of diabetes.  $\beta$ -cell dysfunction along with glucotoxicity, lipotoxicity, and other inflammatory agents on pancreatic insulin production all play a contributing role in the development of DMT2 (Rizvi, 2004).

Tissue resistance to glucose uptake is also recognized as a major cause of DMT2. Insulin resistance has been linked to elevated levels of pro-inflammatory cytokines that trigger endothelial cell dysfunction and promote vascular abnormalities. These mechanisms may lead to atherosclerosis and coagulation tendencies which can also be present with DMT2. Although these causes are not linked to diabetes alone, they are found in other chronic diseases such as dyslipidemia and hypertension which are known risk factors of diabetes. (Rizvi, 2004).

### **Dimension Two: Incidence and Prevalence**

DMT2 accounts for 90 to 95 percent of all diagnosed cases of diabetes and usually begins as insulin resistance. It is often associated with older age, obesity, family history of diabetes, history of gestational diabetes, impaired glucose metabolism, physical inactivity, and race/ethnicity. In the US, the populations most affected are Native Americans, Hispanic-Americans, and

Asian-Americans. According to the National Diabetes Information Clearinghouse (NDIC) (2007), there are approximately 798, 000 new cases of diabetes annually in the US, which is an estimated 1 in 340 people per year. Broken down even further, this is about “ 66, 499 per month, 15, 346 per week, 2, 186 per day, 91 per hour, and 1 per minute” cases (NDIC, 2007, ¶6). In 2002, there were 150 million people affected with DMT2 worldwide and 15. 7 million people in the US, with an estimated 5. 4 million of those undiagnosed. DMT2 affects approximately 1 in 16 people (NDIC, 2007).

### **Dimension Three: Audience**

Student nurses at Southwestern Community College recently hosted a health fair discussing various diseases and concerns amongst the community. To present the information, student nurses used a demographic audience analysis in order to identify the population attending the health fair. This type of audience examination described the qualities of a group of people by considering several aspects, such as the size of the audience, diversity, captivity or circumstances, as well as the audience composition (Outloud Online, n. d.). The size of the audience determined the way of presenting information; for instance, the large audience would likely have a wide variety of characteristics whereas the smaller audience may have fewer differences. Consequently, presenting information to a large group of people required a more formal approach (Outloud Online, n. d.). On the other hand, small audiences allow for a more personal and informal presentation. Because the health fair was designed to attract a large group of people from three different counties the student nurses concluded that the formal way of presenting information during the health fair would be more appropriate.

The second component of the audience analysis referred to the diversity of people attending the health fair. Generally, the larger audiences are more diverse and require a broader approach (Outloud Online, n. d.). On the other hand, special occasions such as health fairs attract a variety of people who are interested in health and wellness. Consequently, the student nurses decided to address the topic of increasing incidence of diabetes during the health fair in a non-judgmental way with the consideration for cultural variations among people.

The next element of the audience analysis was related to circumstances of presenting information. For example, people who chose to listen on their own were more receptive than the people were forced to hear something. The term captive described the audience who may resent a speaker; therefore the speaker needed to exert an extra effort to get the audience's attention (Outloud Online, n. d.). Generally, an assumption can be made that the audience is captive and works hard to show the importance of the topic. In order to capture the attention of the audience, the student nurses decided to utilize variety of visual, tactile, auditory, as well as psychomotor teaching methods to present the information about diabetes during the health fair, which will be explained further below.

The last component of the demographic audience analysis was related to the composition of the audience. The student nurses considered the factors, such as age, race or culture, gender, as well as education level of the community population. Although the composition of the audience was important, the simplifying people's interest and beliefs could have easily led to stereotyping (Outloud Online, n. d.). In order to avoid stereotyping of

audience, the student nurses decided to provide information without cultural and ethnical preconceptions as well as in a non-judgmental way.

#### **Dimension Four: Survey and Other Research**

In prior years, much research has been conducted on the incidence and prevalence of DMT2. This research validates the increasing rate of diabetes amongst the US population. It was estimated that in 1999-2002, 19.3 million Americans (about 9.3 percent of the total population) had diabetes. By 2005, approximately 1.5 million new cases of diabetes were diagnosed in the US and at this rate, it is estimated that more than 25 million people in the US will have diabetes by the year 2025. According to research conducted by the Tufts-New England Medical Center (2007), the rise of DMT2 anticipated over the next few decades can be attributed to the changes in diagnostic criteria, increased awareness which leads to increased diagnosis, the aging population, increase in the prevalence of obesity, and decreasing mortality. Although the prevalence of diagnosed diabetes from 1980-2004 increased in all age groups, it is similar to other chronic conditions and affects the older population. It is estimated that over 22 percent of the elderly population (age 65 and older) make up almost 40 percent of those diagnosed with diabetes. In 2005, there were 575,000 new cases of diabetes among those 60 years and older (Balk, et al., 2005).

Other research has shown that DMT2 may be described as a new epidemic in the American pediatric population. In 1994, DMT2 accounted for up to 16 percent of new pediatric diabetes cases, and by 1999, it accounted for 8-45 percent of new cases. This increase coincided with the increased prevalence of childhood obesity. In 2000, the prevalence of diabetes for all ages

worldwide was estimated to be 2.8 percent. Based on current research, it is predicted that 4.4 percent will be diagnosed with DMT2 in 2030, which will be an estimated total number of 366 million (Balk, et al., 2005). Results from a Pan American Health Organization survey conducted in 2007 along the Mexico-US border can be found in Appendix A. Another survey on the rising prevalence of obesity among the younger population can be found in Appendix B.

### **Dimension Five: Disease Prevention**

Although the need to prevent DMT2 was recognized in the 1920's, little has been done in the area of prevention in the decades following despite the technological advances. This lack of implementing a prevention plan was also due to the lack of evidenced-based studies. Several clinical trials were conducted, but many were flawed in design and most studies used anti-diabetes drugs as the only intervention. Fortunately in the intervening years, positive results from several controlled trials using lifestyle changes have become available. More recent trials show it is possible to reduce the rate of DMT2 in high-risk clients through lifestyle modifications such as diet and exercise (Tuomilehto, 2007).

Pre-diabetes is a condition in which a client's blood glucose level is higher than normal, but not yet high enough to be termed diabetes. Either the impaired fasting glucose or impaired glucose tolerance tests will be higher. If a client shows increased test results with these two tests, however, progression to diabetes is not inevitable. Losing weight and increasing physical activity has been shown to reduce the blood sugar levels to a more normal range and delay the onset of diabetes. These lifestyle interventions

are attainable and much more cost-effective and it is proven that lose 5-10 percent of body weight can reverse pre-diabetes symptoms. (Adams, 2009).

Physical activity increases the body's use of insulin which in turn lowers blood glucose levels. Reducing the amount of time sitting in front of a television is an effective way to increase physical activity. A study in 2007 showed a direct link between television watching and an increased risk of diabetes. Those with a two-hour increase in television viewing had a 23 percent increase in the risk of obesity, leading to a 14 percent increase risk of DMT2 (Tuomilehto, 2007). Nutrition recommendations for prevention of diabetes include high intakes of dietary fiber and low-glycemic-index foods. Eating a well-balanced diet with adequate amounts of protein and carbohydrates with lower amounts of saturated fats and sugars has proven to be effective in the prevention of DMT2 (Mann, 2006).

### **Dimension Six: Teaching Plan**

A health fair was recently held on the campus of Southwestern Community College. Each group attending the health fair was given one table to present information in a systematic manner that would be beneficial to those passing by. The authors of this research paper, who are also student nurses, chose to concentrate on basic DMT2 pathophysiology and prevention. To effectively present the material to a varied audience, the student nurses came up with strategies to teach the materials that would appeal to various learning styles. For those who may learn visually, the student nurses provided visual aids including a large display board along with two posters. These materials included written information, pictures, and diagrams of DMT2's effects on the body as well as descriptions of the pathophysiology and causes. For the



audience to take with them or look through while browsing, the student nurses provided tactile objects such as pamphlets about diabetes and exercise, diabetic cookbooks, diabetic desserts from the cookbooks, and three factual information sheets about DMT2 from a local diabetes educator. For those who were audio-style learners, several student nurses stayed near the information table and were available to answer questions and speak with those interested and/or concerned they may be at risk for developing DMT2. Also available to the audience as reinforcement of this information was a video which spoke of signs and symptoms of pre-diabetes as well as preventative strategies. To further test for symptoms of pre-diabetes, student nurses were available with a glucose monitor to check glucose levels when requested. Overall, the health fair seemed to be quite effective and pleasing to the audience present based on review.