

The Diabetes Pandemic and Public Health

VK Raju^{1*} and Leela V Raju²

¹*Clinical Professor, West Virginia University and Founder, Medical Director, Eye Foundation of America, USA*

²*Clinical Associate Professor, NYU Langone Medical Center, USA*

***Corresponding Author:** VK Raju, Clinical Professor, West Virginia University and Founder, Medical Director, Eye Foundation of America, USA.

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“It may be prognosticated that an idle man, who indulges in day sleep, or follows sedentary pursuits or is in the habit of taking sweet liquids, or cold and fat-making or emollient food, will ere long fall an easy victim to this disease”.

-Susruta of ancient India

“Man may be the captain of his fate, but he is also the victim of his blood sugar”.

Wilfrid Oakley (1962)

Diabetes: mechanism, complications, and incidence

During normal glucose use, the hormone insulin enters the bloodstream from the pancreas, and glucose enters the bloodstream from the digestive system and liver. Insulin leaves the bloodstream when it binds to cells. In response, the cell takes up glucose and uses it for fuel, maintaining a balance of glucose and insulin in the bloodstream. However, in individuals with diabetes, insulin is unable to bind with the cell. Glucose cannot enter the cell and remains in the bloodstream. Consequently, an unhealthy amount of glucose circulates through the bloodstream and the cell does not have glucose for fuel.

Diabetes affects a myriad of systems in the body, including the heart and blood vessels, eye, kidney, nerves, teeth, and skin. In particular, retinopathy, cataract, and glaucoma are diabetic eye diseases. Retinopathy is characterized by damage to small blood vessels in the retina. An individual with diabetes is nearly twice as likely to get glaucoma, which is increased pressure inside the eye. Cataract, or clouding of the eye's lens, develops at an earlier age in people with diabetes. Although a great deal of ophthalmic effort is directed towards decreasing the worldwide cataract burden, the number of patients at risk for vision loss from diabetes will soon be 10 times greater. Diabetic blindness tends to occur at a time when people are younger and more productive in society, resulting in a great societal and economic burden.

Currently, more than 100 million people in the US have diabetes or prediabetes. That means one-third of the country's population is affected. Public health practitioners in the US have made great advances during the 20th century, but prevention and treatment of diabetes remains a challenge. Diabetes is still poorly understood and generally poorly managed. The National Centre for Health Statistics reported in 1998 that the age-adjusted death rate relative to that in 1980 increased for diabetes, while it decreased for stroke, cardiovascular disease, and cancer.

Influence of diet and obesity on diabetes

In West Virginia, the adult obesity rate has steadily increased from 13.7% in 1990, 26.7% in 2004, and 35.1% in 2013. WV ranks first in adult obesity among all other states. The rates increased in 6 other states in 2013: Alaska, Delaware, Idaho, New Jersey, and Wyoming. In WV, 1 in 5 children in the fifth grade has high blood pressure, high cholesterol, or is obese. Logan County, WV represents a worst case scenario for the interaction between poverty, lack of education, and poor lifestyle choices. The population is 37,000, where 15% of people over 20 years old have diabetes. Logan County is home to 37 fast food restaurants and the local Wal-Mart sells more snack cakes than any other Wal-Mart in the world.

The food industry also plays a role in promoting products with detrimental effects on health. Coca-Cola is the world's largest producer of beverages with high sugar content. The company recently promoted a "science-based" solution for obesity: exercise more without worrying about calorie consumption. This campaign was launched in response to recent widespread efforts to tax sugary drinks and remove them from schools. The industry giant funded influential scientists to back their message that their products were not largely responsible for the recent increases seen in obesity and type 2 diabetes. However, it is known that exercise has less of an effect on weight than poor diet.

The influence of society on lifestyle choices has been well documented. For example, a recent study in the *New England Journal of Medicine* found that over the course of 32 years, a person's chance of becoming obese increased by 57% if he or she had a friend who became obese, 40% if siblings become obese, and 37% if the spouse does. Friends and family members of the same sex had more influence than those of the opposite sex. The same study also found that friends and families who lost weight imparted a similarly powerful influence on people's odds of losing weight themselves. Statistically significant effects could be seen even with friends-of-friends.

The US public health perspective

Last year, the US spent close to \$3 trillion on healthcare, which is equivalent to the entire economy of France. The amount spent on institutional care, outpatient care, and outpatient medication and supplies steadily increased from 2002 to 2012. Many countries tend to be influenced by the US public health perspective. If other countries follow the example of the US and begin a futile attempt to focus on the treatment of diabetes, it could have ruinous consequences for local economies and fragile health care systems. For example, in many African countries the cost of one vial of insulin may be the equivalent of a month's salary.

The paradox of disease prevention is that it is celebrated in principle but resisted in practice. We cannot afford to think that "Prevention of disease is not good for the economy". Five potential strategies could mitigate this: 1) pay for preventive services; 2) make prevention financially rewarding; 3) involve employers to promote health; 4) make prevention simple (reengineer); and 5) multiple media channels to educate. Doctors should counsel patients regarding lifestyle modification that enables them to control their glucose levels; these changes include regular exercise and a healthy diet.

Public policy

Social (social position), environmental (places), lifestyle (individual behaviors), and physiological influences (the body) contribute to type 2 diabetes. Healthy public policies can address social structure, which is affected by social class, age, sex, and race/ethnicity. Geographical location, housing conditions, occupational risks, and access to services all act as environmental influences and must be targeted by organizational and community interventions. Primary and secondary prevention efforts are crucial for lifestyle influences, such as smoking, nutrition, physical activity, and psychosocial factors. Cigarette smoking kills 434,000 Americans each year, which is more than alcohol, car accidents, drunk driving, cocaine, crack, heroin, homicides, suicides, fires, and AIDS combined. Secondary prevention alone can ameliorate physiological influences, including high blood pressure, high cholesterol, and obesity.

Therefore, a balanced whole-population public health approach to diabetes must simultaneously involve interventions at all levels: upstream public policy, midstream primary and secondary prevention, and downstream tertiary treatments. One example of an upstream healthy public policy is the Tobacco Control Bill of 1998, which proposed to institute measures that would have simultaneously curtailed both the production and consumption of tobacco. Policy, systems, and strategies for environmental change advocated by coalitions, partnerships, and limited by leverage funds and community resources, must trickle down to all sectors of the population, including schools, the workplace, the community, and health care settings. This in turn affects policy, city and county ordinances, and system and environmental change, ultimately leading to sustainability.

A National Diabetes plan would require national health insurance, tax incentives, healthy lifestyle education in school, exercise programs, and city planning. At the community level, diabetes prevention guidelines, community-based screening and prevention programs,

intervention manager training, and healthy workplace policies are necessary. Providers would be responsible for management structure, quality management, physical education, and secondary prevention programs. Importantly, individuals would need to understand the intervention materials, provide feedback, and make choices conducive to a healthy environment.

Unfortunately, public health can never be an entirely objective, value-free enterprise. Facts and values cannot be separated in scientific research. Scientific facts, legal issues, personal values, political realities all feed into public policy. Therefore, ultimately, it is the responsibility of each individual to take control of their own health. Finally, to win the war on diabetes, we need "political will, professional will and peoples' will".

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