

Asian Diabetes: Cause, Challenges, and Health Care Reform**

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Summary

Type-2 diabetes (T2D) affects more than 300 million people worldwide and accounts for close to half a trillion dollars annual burden on the world economy. Asian Indians are twice as likely to develop T2D compared with the general population in the United States. Diabetes in the Asian population (Asian diabetes) epitomizes our current struggle in providing adequate care for chronic diseases because of human, social, and economic challenges. Asians frequently escape screening and intervention procedures as telltale signs of weight gain are often missing. Cultural and ethnic issues specific to Asian Indians introduce barriers to patient adherence and effective disease control. A plethora of genetic determinants makes the group vulnerable to disease through poorly understood mechanisms, which can contribute to rapid disease progression. Routine care for diabetics is expensive, but a far greater economic burden is the hospital care required for associated complications. Using Asian diabetes as the model, information will be presented on patient-, provider-, and health system-based barriers preventing implementation of evidence-based practices, as well as the opportunities and reforms applicable to the control of T2D in general.

Current realities

Diabetes is an incurable, progressive, debilitating and costly disease. In a five-year period from 2007-2012, the annual direct medical cost of newly diagnosed diabetes increased by 41%, rising from \$175 billion to \$245 billion in direct medical costs. Half of the medical expenditure is attributed to hospital inpatient care and prescription therapies, which would be less distressing if the high cost correlated with high-quality health care. However, when compared with other developed countries, the U.S. is ranked lowest on the list on most standard measures of health.

There are seventeen million type-2-diabetic people in the U.S. If current trends continue, one out of three American adults will have diabetes by 2050. Rapid growth of diabetes in high-risk populations, including Asian Americans, is one reason for increased prevalence of the disease in the U.S. Asian Indians are one of the fastest-immigrating groups to the U.S., reporting a 74% increase in the last decade, second only to Hondurans. Most of the immigrants relocate to the U.S. either in their late teens or early twenties. Upon contact with mainstream culture, they quickly replace traditional cooking with convenient fast food and restaurant take-outs. This rapid shift from traditional wholesome cooking to processed food in a population with elevated genetic predisposition propels first generation Asian Indians into prediabetes. Prediabetic Asian Indians rapidly progress into diabetes as they fail to implement adequate lifestyle changes. In fact, physical inactivity is highest among Asian Indians.

Predisposition to T2D appears to be determined during prenatal growth in Asian Indians. Even though Asian Indian newborns have a lower average body weight relative to Caucasians newborns, they exhibit higher body fat percentage and insulin levels. Asian Indians exhibit lower levels of adiponectin compared to Caucasians, evident at even three to six months. In addition to early onset, T2D in Asian Indians is characterized by greater abdominal obesity despite a relatively lower body mass index (BMI), greater insulin resistance, higher fasting insulin concentrations, and an early decline in beta cell function regardless of age, gender, or BMI.

Scientific opportunities and challenges

Mechanistic, preventive, and therapeutic understanding of T2D is mostly drawn from studies sampling Caucasian patients. Because of differences in body size and physiology between Caucasians and Asians, results may not be fully applicable to Asians (e.g., Pro12Ala

polymorphism of the peroxisome proliferator-activated receptor gamma gene affords protection against diabetes and insulin resistance to Caucasians, but appears not to protect Asians).

Studies have identified approximately 70 genes associated with high susceptibility to T2D and account for about 10% of the overall heritability of T2D. Of these, 29 were identified in the Asian population. Analyses of these loci improved prediction of T2D and facilitated the adoption of early diagnostic and preventative strategies to reduce the growing disease burden. However, relevance of many of these genes in Asian diabetes remains unclear. A recent 2011 genome-wide association study on South Asians, published in *Nature Genetics*, reported common variants at six loci to be associated with T2D. Polymorphisms at three of these genes are known to influence insulin and beta cell function. The results of this study opened up a host of additional questions and possibilities (e.g., How do susceptible genetic loci participate in the pathogenesis of T2D? Mitochondrial mutations, including those in uncoupling proteins, may influence basal metabolic rate [BMR], energy efficiency, visceral fat assimilation, insulin resistance, and T2D). The immediate challenge now is to develop genetic risk score models based on inherited susceptible variants for T2D for the purpose of facilitating early interventional strategies aimed at preventing or delaying the onset of the disease in nondiabetic individuals.

Policy issues

- Empower businesses, raise patient accountability: Experience-based group education, and counseling to high-risk and youth populations are already in place and contributing to the fight against T2D. However, most prediabetic and diabetic subjects fail to commit or adhere to a healthy lifestyle due to lack of positive reinforcement. Much of this problem can be resolved by incentivizing small businesses outside of the healthcare system that are looking for business opportunities to counsel individuals on exercise and diets, as well as for opportunities to offer periodic tests for glycemia, lipids, blood pressure, and body composition. This solution cannot be viewed as a cost-saving strategy, but rather as a measure to reduce the burden of chronic disease by improving access to frequent noninvasive monitoring systems and through positive reinforcement for lifestyle transformation, while also raising patient accountability in disease outcomes. Funds must be made available through national and state level grants. Proven and skilled assistant professors devoted to solving the T2D crisis, who have been denied tenure, may find this new opportunity compelling and rewarding.
- Treatment algorithm: Clinical trials of treatment options assessing cost effectiveness, optimizing patient outcomes, and evaluating potential risk need to be conducted through partnerships between academic institutions and government agencies. Agencies like National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) at the National Institutes of Health (NIH), focus research efforts and clinical trials in diabetes that are typically not pursued by drug companies. Based on funding availability for new research initiatives, competitive Requests for Application (RFAs) are issued. However, considerable uncertainty exists regarding the primary outcome, sample size, and the retention rate of trial participants. Therefore, the feasibility of trial design, duration, and budget are unknown throughout the RFA process. Investigator-initiated planning grants have the potential to be robust and efficient, and must be adapted by NIDDK.
- Delivery and access: As patients progress to a diabetic state, associated comorbidities inevitably arise, which cannot be adequately addressed by episodic face-to-face interactions with a single physician. Given that diabetes care has robust evidence-based guidelines, high-cost involvement, and demonstrates a quality gap, principles of Patient-Centered Medical Home (PCMH) and Patient-Centered Specialty Practice (PCSP) can be adapted by primary health care providers. The basic elements of these models are effective and comprehensive care coordination, quality and safety, patient orientation, referral arrangements, and enhanced access and payment. Referral visits to specialty

consultants, diabetes educators, or dieticians can be tracked to ensure appropriate and timely care. Success will largely depend on the ability to engage physicians, both primary care and specialists, and to standardize care coordination, data integration, shared learning, and cost transparency among participating practices.

- Focus on outcome not volume: PCMH projects across the country are researching ways to implement better care coordination by using information technology, improving communication between patients and care providers, and adopting a transparent, accountable, and coordinated team approach. Despite the value and enthusiasm, financial barriers have impeded large-scale integration of the PCMH model. The current reimbursement formula does not reward quality service, but rather encourages volume. This open-ended, fee-for-service payment system is the prime contributor to the high level and rapid growth in healthcare spending. Acute and chronic care pilot programs should be developed that encourage and incentivize desired outcomes in patient experience, cost, quality, and efficiency. Risk-adjusted, pay-for-performance practices must be implemented through programs promoted by the Center for Medicare & Medicaid based on evidence and focused outcomes in diabetic chronic care management. Allowances for care outside of face-to-face visits, as unveiled by Centers for Medicare & Medicaid Services (CMS), are also a step in the right direction. However to successfully implement the reform consumers demand, the open-ended, fee-for-service system also needs to be changed by educating consumers on the benefits of PCMH models in T2D control.
- Challenges and solutions: In providing managed care, lower income citizens must be protected through guaranteed access and subsidies, and disparities in health outcome must be minimized. First, racial differences in the outcome of diabetes care in PCMH settings have already been observed and must be avoided by identifying and overcoming limitations that enable better reporting of health outcomes by race and ethnicity. Second, employer-based insurance must be encouraged to transition into managed care. This can be achieved through tax breaks and by educating employers about the value of a patient-centered approach. Third, public debates and legislations must be put in place to incentivize active lifestyles and healthy nutrition habits. Discounts in health premiums could be an encouraging option for high-risk populations, such as South Asians. Incentives can also be introduced for people with known familial diabetes and cardiovascular risk for actively delaying the progression into prediabetes through physical activity and dietary alterations. Although we will likely end up spending more in prevention strategies, the cost from productivity losses associated with diabetes will offset this cost. However, if reform is to be implemented, our lawmakers need to hear our organized voice louder and more frequently. The American Diabetes Association already outlines the blueprint for the reform priorities. We need to act now.
- Therapeutic guidance: Not all diabetic patients respond favorably to generic treatments. Variations in their genomes affect their responses and outcomes. Studies strongly suggest that efficacy and response to diabetic medicines (e.g.,sulphonylurea, biguanides, glinides, glitazones) is dictated by genomic variations. These pharmacogenomic findings have yet to be implemented in T2D-clinical practice. Genetic testing must be widely employed to predict, optimize and personalize treatment in patients with T2D to improve outcomes.

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