Indian J Med Res 124, November 2006, pp 481-484

# Editorial

## Addressing the diabetes pandemic: A comprehensive approach

Diabetes is pandemic in both developed and developing countries[1]. In 2000, there were an estimated 175 million people with diabetes worldwide. By 2030, the projected estimate of diabetes is 354 million. The greatest relative increases are predicted in the developing countries of the Middle Eastern Crescent, sub-Saharan Africa and the Indian subcontinent. In 2030, over 85 per cent of the world's diabetes patients will be in developing countries. In India alone, the prevalence of diabetes is expected to increase from 31.7 million in 2000 to 79.4 million in 2030[2]. These estimates are valid only if the prevalence of obesity remains the same. Since the incidence of obesity is rising at an alarming rate in developed and developing countries, the projections for the number of diabetics could well be a gross underestimation.

A major reason for the rise of diabetes can be attributed to the recent increase of obesity. Approximately 60 per cent of diabetes cases can be attributed to obesity and weight gain[3]. The current obesity epidemic is largely due to environmental factors including increased urbanization, improved access to large quantities of food, increasing mechanization of labour and other aspects of society. One study has suggested that urban dwelling is an independent risk factor of obesity and diabetes in India[4]. Throughout India and other developing countries, there is improved availability of food. Unfortunately, this food is often high in fat and available in large quantities. Mechanization has led to sedentary jobs and decreased physical activity at home and in the field. Mechanized transportation has also led to a decrease in walking and urbanization has led to a decrease in the need for distance walking. This leads to a decrease in a physical activity, which further contributes to obesity.

Unfortunately, obesity and diabetes are no longer diseases just of adults. The United States and many other countries have seen a surge in the number of children and adolescents with obesity, insulin resistance and type 2 diabetes. While type 2 diabetes previously represented less than 5 per cent of new diagnoses of diabetes in children in the United States, it now represents as much as 45 per cent of the new diagnoses[5]. Some areas have seen a 10-fold increase in the number of cases of paediatric type 2 diabetes. Similar to adults, this rise in paediatric obesity and diabetes is thought to be largely related to environmental factors including decreased physical activity and increased caloric intake - particularly of energy dense food and sugar-sweetened beverages. Fast food and sugar-sweetened beverage consumption are also increasing in developing countries. This is likely contributing to increasing rates of obesity and type 2 diabetes in these countries. A recent survey of Pakistani school children revealed that 40 per cent eat fast food and consume sugar-sweetened beverages daily[6]. In a study of school age children in New Delhi, 18 per cent were found to be overweight and 27 per cent were found to have impaired glucose tolerance. The authors estimate that 15-25 per cent of urban school children in India are at risk of developing type 2 diabetes at an early age[7].

Once diabetes has been established, the cost of managing diabetes and preventing or treating complications can be quite high. In the United States, direct costs related to diabetes and diabetes related complications now exceed $92 billion per year. In addition, the indirect costs due to diabetes from lost workdays, restricted activity days, mortality, and

The editorial is published on the occasion of World Diabetes Day - November 14, 2006.

permanent disability totaled over $48 billion[8] per year. Costs of treating diabetes and diabetes-related complications such as blindness, end-stage renal disease and cardiovascular disease can be exorbitant, particularly for developing countries.

Given the high financial and societal costs of diabetes, there is an immediate need for primary prevention strategies. The Diabetes Prevention Programme and other recent studies have shown that lifestyle modifications, centered on a healthy diet, physical activity and weight loss, can prevent the development of type 2 diabetes[9]. A similar study performed in India also showed that lifestyle modification was effective in the prevention of diabetes[10].

Community-based, group centered public health interventions have shown benefit both in improving glycaemic control and preventing diabetes. The Zuni Diabetes Project is a primary and secondary prevention programme in a Native American community. The primary prevention programme is targeted to high school age adolescents and involves healthy lifestyle education, a wellness center and modification of available foods at the local high school. Participants had a significant decrease in soft-drink consumption and a decrease in hyperinsulinaemia[11]. Similar interventions may be of use for the prevention and management of diabetes in other countries. These interventions should focus on healthy diet and physical activity. Involving community stakeholders in the development and implementation of the programme will increase the utility and likely success of the programmes. Incorporating community leaders and other prominent persons in the implementation may also lead to higher participation rates for longer periods of time.

School systems, which are a centralized part of most communities, represent an important opportunity for interventions to prevent diabetes. With an alarming increase in childhood and adolescent obesity and diabetes, prevention programmes are especially important for this population. Some of the most successful school prevention programmes have focused on increased physical activity while at school. Another area of success has centered on changing the make-up of available foods at school. Many of these programmes need to be coupled with home-based dietary and activity educational programmes where the parents are receiving similar intervention as the children. Programmes should be developed that address specialized needs of each population.

There are many environmental interventions that have been proposed and may be beneficial to some communities. Increasing sidewalks and bike paths provide safe transit for walkers, runners and cyclers. Encouraging patrons and employees to take the stairs increases non-exercise physical activity. Offering healthy food alternatives in local cafeterias and vending machines and decreasing high fat, energy dense options promotes selection of healthy food items. There are more dramatic measures that have been suggested including a special tax for high fat food, similar to cigarette taxes, and charging obese patients more for health insurance.

Local attitudes and cultural context may present significant barriers to prevention of diabetes and the maintenance of healthy weight. The INCLEN study conducted focus groups in India, Indonesia, Cameroon, Egypt and Australia to explore sociocultural influences on perceptions of obesity, physical activity and dietary change[12]. In Cameroon, urban and rural dwellers felt that fatness was associated with prestige. Women in Indonesia reported fasting if they felt above their ideal weight. They believed overweight people were perceived as lazy, weak and without “life passion.” In India, women were concerned about maintaining their weight in order to be married. After marriage, the women felt that weight gain was a sign of happiness. They reported gyms and sporting clubs available in urban areas; however, some women reported needing permission from their families before they could begin an exercise programme. In Egypt, some women report that it is unacceptable for women to practice sports, exercise or walk for distance. Each country identified unique sociocultural influences and attitudes. It is important to understand these

influences and attitudes before beginning a public health effort. Targeted public health programmes may be needed to achieve efficacy in diverse populations, even within the same country[12].

Once diabetes is diagnosed, adequate treatment requires a significant amount of resources patient access to glucose meters, testing supplies, medications and regular access to health care and referral to specialists for management of complications. Importing medications, glucose meters and testing supplies from other countries is expensive. For a person of low economic standing in India, diabetes care can translate to 25 per cent or more of their family income for each person with diabetes[13]. The long-term complications of diabetes are also costly. The most common complications can lead to blindness, renal failure and amputations. Not only are these complications expensive to treat but also cause enormous productivity losses and significant social burden to the patient and family.

Current management of diabetes is often sub-optimal. Systems-based changes in healthcare are needed to improve the management of diabetes. Chronic care models have become increasingly popular in the United States. These models develop comprehensive, evidence-based approaches to diabetes care that often include the use of treatment algorithms, population level tracking of patient data and multi-disciplinary teams of health care providers. Studies have shown that disease management programmes can significantly improve glycaemic control and cardiovascular factors in patients with diabetes[14]. Many of these models may be too expensive to be realistic for implementation in developing countries where resources are limited. Developing countries will need to pull from the growing field of chronic disease management to develop cost-effective, evidence-based approaches to broad-based public health interventions. Small scale lifestyle modification interventions have been successful in some developing countries. For example, a 12 wk intervention in rural Costa Rica for patients with type 2 diabetes incorporating weekly nutrition classes and triweekly walking groups demonstrated a significant weight loss. This intervention also showed improvement in glycated haemoglobin and fasting glucose[15]. Public health interventions that can be developed locally are likely to be more cost-effective than importing expensive medications from abroad. This will be especially true if similar interventions can be used for prevention as well as treatment.

There are many significant barriers to adequate diabetes management. Two important barriers include poor patient literacy skills and inadequate financial resources of the patient and at the system level. Management of diabetes may be complicated by the problem of poor health literacy and numeracy. Recent studies in the United States have shown that poor health literacy is associated with worse diabetes knowledge and worse diabetes related outcomes[16]. Addressing health literacy in diabetes management can likely help to improve outcomes[17]. In India, literacy may be an even greater challenge, given that there are 18 major languages and over 200 dialects[13]. Financial resources are a major limitation to diabetes care, particularly for developing countries. In India, the government spends very little on healthcare - less than a half of a rupee per person[13]. The money that is spent on healthcare in many developing countries primarily goes to prevent communicable disease and to provide sanitation and clean drinking water - chronic disease prevention and management is not a top priority[13].

As the worldwide prevalence of diabetes increases, more cost-effective and efficacious primary preventive and chronic care models will be needed. These models will need the support and endorsement of local leaders for successful implementation and maintenance. Promotion of healthy weight through diet and physical activity is essential to slow the alarming rise in diabetes. The pandemic of diabetes will require activism and intervention by every country in a co-operative fashion. Knowledge sharing of effective preventive and management strategies between countries will allow for faster, more efficient progress in successfully treating the diabetes pandemic.

## Acknowledgment

Dr Huizinga is supported by the National Quality Scholars Program, United States Department of Veterans Affairs. Dr Rothman currently receives funding support from an NIH Career Award (K23 DK065294) and from the American Diabetes Association (Novo Nordisk Clinical Research Award), and The Pfizer Clear Health Communication Initiative.

**Mary Margaret Huizinga*&**
**Russell L. Rothman**[+]

VA Tennessee Valley Healthcare System GRECC & [+]Division of General Internal Medicine & Public Health, Department of Medicine, Center for Health Services Research, Vanderbilt University Medical Center, Nashville, TN, USA
**For correspondence*:
e-mail: mary.margaret.huizinga@vanderbilt.edu

## References

1. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. *Diabetes Care* 1998; *21* : 1414-31.

2. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care* 2004; *27* : 1047-53.

3. Yach D, Stuckler D, Brownell KD. Epidemiologic and economic consequences of the global epidemics of obesity and diabetes. *Nat Med* 2006; *12* : 62-6.

4. Ramachandran A, Snehlatha C, Dharmaraj D, Viswanathan M. Prevalence of glucose intolerance in Asian Indians. Urban-rural difference and significance of upper body adiposity. *Diabetes Care* 1992; *15* : 1348-55.

5. Fagot-Campagna A, Pettitt DJ, Engelgan MM, Burrows NR, Giess LS, Valdez R, *et al*. Type 2 diabetes among North American children and adolescents: an epidemiologic review and a public health perspective. *J Pediatr* 2000; *136* : 664-72.

6. Hydrie MZI, Basit A, Badruddin N, Ahmedan MY. Diabetes risk factors in middle income Pakistani school children. *Pak J Nutr* 2004; *3* : 43-9.

7. Misra A, Vikram NK. Insulin resistance syndrome (metabolic syndrome) and obesity in Asian Indians: evidence and implications. *Nutrition* 2004; *20* : 482-91.

8. Hogan P, Dall T, Nikolov P, American Diabetes Association. Economic costs of diabetes in the U.S. in 2002. *Diabetes Care* 2003; *26* : 917-32.

9. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, *et al*. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 2002; *346* : 393-403.

10. Ramachandran A, Snehlatha C, Mary S, Mukesh B, Bhaskar AD, Vijay V, *et al*. Indian Diabetes Prevention Programme (IDPP). The Indian Diabetes Prevention Programme shows that lifestyle modification and metformin prevent type 2 diabetes in Asian Indian subjects with impaired glucose tolerance (IDPP-1). *Diabetologia* 2006; *49* : 289-97.

11. Teufel NI, Ritenbaugh CK. Development of a primary prevention program: insight gained in the Zuni Diabetes Prevention Program. *Clin Pediatr (Phila)* 1998; *37* : 131-41.

12. Treloar C, Porteous J, Hassan F, Kasniyah N, Lakshmanudu M, Sama M, *et al*. The cross cultural context of obesity: an INCLEN multicentre collaborative study. *Health Place* 1999; *5* : 279-86.

13. Sadikot S. The Indian Task Force on Diabetes Care in India. *Diabetes India*. *http://www.diabetesindia.com/diabetes/itfdci.htm*. Accessed on April 6, 2006.

14. Piatt GA, Orchard TJ, Emerson S, Simmons D, Songer TJ, Brooks MM, *et al*. Translating the chronic care model into the community: Results from a randomized controlled trial of a multifaceted diabetes care intervention. *Diabetes Care* 2006; *29* : 811-7.

15. Goldhaber-Fiebert JD, Goldhaber-Fiebert SN, Tristan ML, Nathan DM. Randomized controlled community-based nutrition and exercise intervention improves glycemia and cardiovascular risk factors in type 2 diabetic patients in rural Costa Rica. *Diabetes Care* 2003; *26* : 24-9.

16. Gazmararian JA, Williams MV, Peel J, Baker DW. Health literacy and knowledge of chronic disease. *Patient Educ Couns* 2003; *51* : 267-75.

17. Rothman RL, DeWalt DA, Malone R, Bryant B, Shintani A, Crigler B, *et al*. Influence of patient literacy on the effectiveness of a primary care-based diabetes disease management program. *JAMA* 2004; *292* : 1711-6.