

## REVIEW

# Diabetes in Vietnam



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### Abstract

**BACKGROUND** The prevalence for diabetes, prediabetes, and gestational diabetes in Vietnam are low relative to other parts of the world, but they are increasing at alarming rates. These changes have occurred in the setting of economic and cultural transitions.

**OBJECTIVES** The aim of this study was to provide relevant information depicting the diabetes burden in Vietnam.

**METHODS** Literature was reviewed using PubMed and local Vietnamese sources, including papers published in the Vietnamese language.

**FINDINGS** In 2012, the prevalence of diabetes was 5.4% and prediabetes 13.7%. In 2005, the prevalence of obesity was 1.7%. There is a dual burden of over- and undernutrition observed in Vietnam. Diabetes is associated with an increased waist-to-hip ratio despite normal body mass index. Nutritional transitions occurred with increased protein, fat, and fast foods, and with decreased fresh fruits and vegetables. Tobacco use is very high in Vietnam with 66% of adult men currently smoking. Challenges include endocrinology training, health care coverage, patient education, and lack of coordination among government and specialist agencies.

**CONCLUSION** Diabetes is a growing problem in Vietnam and is associated with obesity, changes in dietary patterns, and other cultural transitions. More research is needed to better understand this health care problem and to devise targeted interventions.

**KEY WORDS** diabetes, diabetes care, Southeast Asia, type 2 diabetes, Vietnam

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## PREVALENCE AND RISK FACTORS

Vietnam is situated in the Southeast Asia region with a surface area of 365,000 km<sup>2</sup> and a population of approximately 94 million, ranking as the 15th most populous country in the world. The Kinh (Viet) people account for 85% of the population and the Hoa people, from Chinese ancestry, live primarily in the urban area. Other ethnic groups number <1000 and live mostly in remote area and the highlands.<sup>1,2</sup>

In surveys from the early 1990s, the prevalence of diabetes was 1.01% in Hanoi, 0.96% in Hue, and 2.5% in Ho Chi Minh City (HCMC)—the 3 representative cities in the north, center, and south of Vietnam, respectively.<sup>3</sup> In 2008, a survey in HCMC of 720 men and 1421 women using cluster sampling and oral glucose tolerance testing (OGTT) to define diabetes, found that the prevalence was 10.8% in men and 13.2% in women.<sup>4</sup> HCMC is the largest and most economically developed city in Vietnam and the increased use of

OGTT may explain the relatively higher prevalence rates. The independent risk factors for diabetes in Vietnam were high blood pressure and increased waist-to-hip ratio (WHR).<sup>4</sup> In 2012, a national survey found the prevalence of diabetes in Vietnam to be 5.4% and impaired glucose tolerance to be 13.7%.<sup>5</sup> In this survey, diabetes also was more prevalent in big cities and less prevalent in remote areas such as the highlands<sup>5</sup> with rates of both prediabetes and diabetes accelerating at alarming levels.<sup>6</sup> In a recent outpatient clinic and hospital-based study, the age of onset of type 2 diabetes (T2D) was in the fourth to fifth decade, with younger onset associated with poorer metabolic control than older onset.<sup>7</sup>

Adherence with diabetes treatments in the 40- to 64-year age group was found to be lower in rural areas than in urban regions, arguing for increased education.<sup>8</sup> Depression is more likely in men with undiagnosed T2D in Vietnam.<sup>9</sup> Furthermore, in a cross-sectional study of children and adolescents (age <19 years), glycemic targets of hemoglobin A1c <7.5% were not being met; the barriers to optimal control remain poorly understood in Vietnam.<sup>10</sup>

Along with the increase in diabetes in the general population, a survey at a tertiary obstetrical referral hospital in HCMC showed that the prevalence of gestational diabetes using the American Diabetes Association criteria (OGTT with 2 results above cutoff considered positive) was 5.9% in 2011, but increased substantially to 20.4% in 2010–2011 with criteria from the International Association of Diabetes and Pregnancy Study Groups.<sup>11</sup>

## CHANGES IN RISK FACTORS

Since the 1990s, there have been significant economic changes in Vietnam, primarily characterized by a shift from an agricultural- to an industrial-based commerce. This economic transition was accompanied by changes in lifestyle and nutrition and resulted in inequitable distribution of income between urban and rural populations. All of these factors have important implications in the epidemiology of diabetes and cardiometabolic risk factors.

**Obesity.** The prevalence of obesity in Vietnam is still relatively low, although it has increased substantially during the past decade, particularly over the past 5 years. Using the US criteria for whites (ie, body mass index [BMI]  $\geq 30$  kg/m<sup>2</sup>), the prevalence of obesity was 0.4% in 2005, 2-fold higher than the 2000 figure.<sup>12</sup> However, using the Asian criteria (ie, BMI  $\geq 27.5$  kg/m<sup>2</sup>), the prevalence of

obesity was 1.7% in 2005, also representing a 2-fold increase from the 2000 figure (Table 1). These increases paralleled ongoing increases in malnutrition, affirming the dual burden of over- and undernutrition in Vietnam, as seen in other developing nations.<sup>12</sup> Moreover, the majority of people with T2D have a BMI <23 kg/m<sup>2</sup> but increased adiposity reflected by a rise in WHR and associated with chronic overconsumption of high glycemic index foods.<sup>13,14</sup>

Most Vietnamese epidemiologic studies are restricted to Hanoi, HCMC, and other large cities and their surrounding areas, although a large portion of the population lives in semi-urban or rural areas. For instance, an earlier 1978 survey of people living in the Mekong delta using the World Health Organization's (WHO) "STEPwise approach to surveillance of non-communicable diseases" (STEPS) methodology, found that 1% of men and 1.1% women had high blood glucose (defined as whole capillary blood glucose of at least 6.1 mmol/L); 8.8% of men and 12.6% of women had a BMI  $\geq 25$  kg/m<sup>2</sup>, and 2.3% of men and 1.5% of women had a BMI  $\geq 30$  kg/m<sup>2</sup>.<sup>15</sup>

**Dietary Habits.** There has been a major shift in dietary habits that parallel the changes observed in obesity prevalence rates. In 1985, the average intake of protein per individual was 52.4 g/day; this figure was increased to 61.9  $\pm$  18.6 g/day in 2000 and 74.3  $\pm$  26.5 g/day in 2010. During the same period, the average intake of lipid increased from 12.8 g/day in 1985 to roughly 24.9  $\pm$  17 g/day in 2000 and 37.7  $\pm$  23.4g/day in 2010.<sup>16</sup>

Results of the National Nutrition Surveys in 1985 and 2010 showed a profound change in the energy content of food in Vietnam. For example, in 1985, only 6.2% of energy (average total daily calories 1925 kcal) was from lipids, but in 2010 this proportion was increased to 17.6%  $\pm$  8.7% with virtually no change in total energy intake. Energy from carbohydrates decreased from 82.6% in 1985 to 67%  $\pm$  10.2% in 2010.<sup>16</sup> However, the

**Table 1. Changes in the Prevalence of Overweight by Various BMI Categories<sup>12</sup>**

BMI Category (kg/m <sup>2</sup> )	2005 (N = 14,452)	2000 (N = 17,163)
$\geq 23$ (%)	11.7	16.3
$\geq 25$ (%)	6.6	3.5
$\geq 27.5$ (%)	1.7	0.9
$\geq 30$ (%)	0.4	0.2

BMI, body mass index.

intake of vegetables and fruits remained unchanged during the same period, composing about 5% of the total daily calories (eg, the amount of leafy vegetables consumed per capita per year was 45.5 kg in 1987 and 53.66 kg in 2000).<sup>17</sup> Furthermore, fast-food chain restaurants emerged at an seemingly exponential rate. In 1997, Kentucky Fried Chicken (KFC) opened its first fast-food restaurant in HCMC. By 2011, Vietnam had 100 KFC restaurants located in 18 large cities employing 3000 workers. In 2015 in HCMC, a plethora of international and Western fast-food chains could be found.

**Cigarette Smoking.** Cigarette smoking is a major risk factor for diabetes in Vietnam. A recent meta-analysis suggests that cigarette smokers are 44% more likely to have diabetes than nonsmokers.<sup>18</sup> Although there is a high prevalence of cigarette smoking in Vietnamese men, this trend is decreasing.<sup>19</sup> In a 1996 survey of 970 men, the prevalence of smoking was 73%,<sup>14</sup> which at the time, was considered among the highest in the world. In 2010, a recent community-based cross-sectional study on osteoporosis found that only 66% of adult men (aged  $\geq 30$  years) actually reported being current smokers.<sup>20</sup>

The prevalence of cigarette smoking is comparable to that in other Asian populations. However, based on these figures, it is estimated that the proportion of diabetes attributable to cigarette smoking may be as high as 22%, identifying cigarette smoking as one of the most important risk factors for diabetes in the Vietnamese population.<sup>19</sup>

## PUBLIC HEALTH STRATEGY AND POLICY

Diabetes is recognized as a public health burden in Vietnam and public health authorities have taken measures to reduce the burden. In 2001, Vietnam collaborated with the WHO to develop and implement a national program to control and prevent major noncommunicable diseases (NCDs), such as diabetes, cardiovascular diseases, cancer, chronic obstructive pulmonary disease, and mental health. Since then, the Program of Diabetes Prevention has been integrated into a national program for NCD.

There is a network of endocrinology and diabetes care providers in every Vietnamese province. Most major Vietnamese hospitals have endocrinology departments caring for patients with diabetes. However, the treatment and prevention of diabetes in Vietnam still face several challenges, including lack

of well-trained health professionals, inadequate coverage of health insurance, and lack of coordination between government agencies and specialist associations.

Vietnam is a low- to middle-income country, with per-capita gross domestic product of about US\$2310.<sup>21</sup> Therefore, the cost of diabetes treatment is a considerable burden to a patient's family budget. In HCMC, the cost of diabetes medication is modest compared with the cost of treatment of other chronic conditions, particularly infectious, cardiovascular, and renal diseases. In 2007, the cost estimates for diabetes in Vietnam were US\$320 million, but expected to increase to US\$1.1 billion by 2025.<sup>21</sup> The average monthly cost of diabetes-related transportation and medicines is about US\$34.41, corresponding to about 18% of the monthly per-capita gross national income.<sup>21</sup>

Health insurance was introduced in Vietnam  $>10$  years ago, but the coverage is still relatively low. In 2010, 60% of the population had health insurance.<sup>22</sup> There are 4 levels of coverage: 100%, 95%, 80%, and 30% of the treatment cost. The remaining cost (which could range between 70% and 100%) must to be met by patients themselves or their families (out-of-pocket costs). In 2014, 66% of the Vietnamese population had medical insurance and the government plans to raise this number to 80% in the very near future. The good news is that children age  $<6$  years and the adults age  $\geq 80$  were 100% covered by medical insurance.<sup>22</sup>

The main findings of a program of rapid assessment of insulin access in 2008 indicated that most patients with type 1 diabetes in overcrowded hospitals in the largest cities received insulin for free, but the cost of transportation from the countryside to the hospital was high, which not surprisingly reduced patient adherence. It is unfortunate that a great proportion of children with type 1 diabetes do not reach adulthood due to severe complications.<sup>23</sup>

## CONCLUSIONS

The diabetes burden in Vietnam results from several epidemiologic changes and drivers (Table 2). Diabetes has the potential to reach epidemic proportions and as a result confer a tremendous public health and economic burden in Vietnam. Although the prevalence of diabetes in rural areas is still relatively low, it is on the rise. In major cities, the prevalence of diabetes is as high as in any other Western

**Table 2. Key Findings on Diabetes in Vietnam**

1. A dual burden of over- and undernutrition persists in Vietnam.
2. Diabetes is associated with increased waist-to-hip ratio, despite BMI < 23 kg/m<sup>2</sup>
3. The prevalence rates of obesity and diabetes are on the rise.
4. Economic and nutritional transitions continue to occur.
5. Tobacco smoking is highly prevalent, with 22% of diabetes attributable to smoking.
6. Diabetes care is expensive and health care coverage inadequate.
7. Treatment adherence is an issue, especially for those residing in the countryside.
8. More research is needed on diabetes in Vietnam.

BMI, body mass index.

population. The increase in the diabetes prevalence rates correlates with changes in risk factors, such as adiposity and a Westernized dietary pattern. It is generally believed that diabetes is preventable

through lifestyle changes that include healthy eating and consistent physical activity, but more research is needed to validate this premise for the Vietnamese community.

## REFERENCES

1. Central Intelligence Agency. The World Factbook: Viet Nam. Available at: <https://www.cia.gov/library/publications/resources/the-world-factbook/geos/vn.html>. Accessed January 2, 2016.
2. United Nations Viet Nam. Viet Nam at a glance. Available at: <http://www.un.org.vn/en/about-viet-nam/overview.html>. Accessed January 2, 2016.
3. Quoc PS, Charles MA, Cuong NH, et al. Blood glucose distribution and prevalence of diabetes in Hanoi (Vietnam). *Am J Epidemiol* 1994;139:713–22.
4. Ta MT, Nguyen KT, Nguyen ND, et al. Identification of undiagnosed type 2 diabetes by systolic blood pressure and waist-to-hip ratio. *Diabetologia* 2010;53:2139–46.
5. National Hospital of Endocrinology. National program on diabetes control and prevention [in Vietnamese]. 1<sup>st</sup> Ed. Hanoi: Medical Publisher; 2012.
6. Nguyen CT, Pham NM, Lee AH, et al. Prevalence of and risk factors for type 2 diabetes mellitus in Vietnam: a systematic review. *Asia-Pacific J Public Health* 2015;27:588–600.
7. Yeung RO, Zhang Y, Luk A, et al. Metabolic profiles and treatment gaps in young-onset type 2 diabetes in Asia (the JADE programme): a cross-sectional study of a prospective cohort. *Lancet Diabetes Endocrinol* 2014;2:935–43.
8. Binh TQ, Phuong PT, Nhung BT. Knowledge and associated factors towards type 2 diabetes among a rural population in the Red River Delta region, Vietnam. *Rural Remote Health* 2015;15:3275.
9. Gale CR, Kivimaki M, Lawlor DA, et al. Fasting glucose, diagnosis of type 2 diabetes, and depression: the Vietnam experience study. *Biol Psychiatry* 2010;67:189–92.
10. Tran F, Vu DC, Nguyen HT, et al. Glycaemic control in children with neonatal diabetes and type 1 diabetes in Vietnam. *Int Health* 2011;3:188–92.
11. Tran TS, Hirst JE, Do MAT, et al. Early prediction of gestational diabetes in Vietnam. *Diab Care* 2013;36:618–24.
12. Ha do TP, Feskens EJ, Deurenberg P, et al. Nationwide shifts in the double burden of overweight and underweight in Vietnamese adults in 2000 and 2005: two national nutrition surveys. *BMC Public Health* 2011;11:62.
13. Le DS, Kusama K, Yamamoto S. A community-based picture of type 2 diabetes mellitus in Vietnam. *J Atheroscler Throb* 2006;13:16–20.
14. Duc Son le NT, Hanh TT, Kusama K, et al. Anthropometric characteristics, dietary patterns and risk of type 2 diabetes mellitus in Vietnam. *J Am Coll Nutr* 2005;24:229–34.
15. Pham LH, Au TB, Blizzard L, et al. Prevalence of risk factors for non-communicable diseases in the Mekong Delta, Vietnam: results from a STEPS survey. *BMC Public Health* 2009;9:291.
16. National Institute of Nutrition, Ministry of Health, Vietnam. General nutrition survey 2009–2010 VDD. Available at: [www.nutrition.org.vn](http://www.nutrition.org.vn). Accessed January 3, 2016.
17. Figuié M. Vegetable consumption behavior in Vietnam. Project #00005600 funded by the Ministry of Foreign Affairs of France. Available at: [https://agritrop.cirad.fr/517071/1/document\\_517071.pdf](https://agritrop.cirad.fr/517071/1/document_517071.pdf). Accessed January 3, 2016.
18. Willi C, Bodenmann P, Ghali WA, et al. Active smoking and the risk of type 2 Diabetes. *JAMA* 2007;298:2654–64.
19. Jenkins CN, Dai PX, Ngoc DH, et al. Tobacco use in Vietnam. Prevalence, predictors, and the role of the transnational tobacco corporations. *JAMA* 1997;277:1726–31.
20. Ho-Pham LT, Nguyen ND, Lai TQ, et al. Vitamin D and parathyroid hormone in a urban population in Vietnam. *Osteoporos Int* 2011;22:241–8.
21. Beran D, Higuchi M. Delivering diabetes care in the Philippines and Vietnam. *Asia-Pacific J Public Health* 2013;25:92–101.
22. Ministry of Health Portal. Available at: <http://www.moh.gov.vn/>. Accessed January 3, 2016.
23. Beran D, Khue NT, Uoc HK, et al. Access to insulin and barriers to care: results of the RAPIA in Vietnam. *Diabetes Voice* 2009;54:19–21.