

Obesity and Type 2 Diabetes in Children and Adolescents: Current Situation and Future Trends in Thailand

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Childhood obesity is an emerging disease worldwide.^{1,2} It occurs with a highest prevalence in developed countries. In Thailand, however, the prevalence has been increasing rapidly in recent years.³ It has been shown that the increase in prevalence and severity of pediatric obesity parallels with the increase in incidence of childhood type 2 diabetes mellitus (T2DM).⁴ Similar to developed countries, recent data demonstrated that there is a rise in the number of cases of T2DM in Thai children and adolescents.³ The purposes of this review are (1) to present the epidemiology of obesity and T2DM in Thai youths and forecast the future trends and (2) to suggest strategies for prevention and early intervention.

Definition

Overweight and obesity are defined as a body mass index (BMI) greater than the 85th and 95th percentile for age and gender, respectively.² Since BMI references for Thai children and adolescents are not available, weight for height reference has been used. A weight for height greater than mean+2SD is considered obese.

Prevalence of obesity and T2DM in Thai children and adolescents

In Thailand, during the past 20 years, the number of children and adolescents diagnosed with overweight/obesity has increased by about 150%. The prevalence was about 6% in 1990 and increased to 13-15% during 1996-1998.³ The prevalence was even higher in Bangkok, particularly in private schools; it was as high as 20-30%. Therefore, the prevalence has been increasing enormously over the past 15-20 years, particularly in urban areas.

During the same period, the prevalence of T2DM has increased significantly.³ One report from Siriraj Hospital, the largest hospital in Bangkok, revealed only 3 cases of childhood T2DM diagnosed during the 10-year period of 1987 to 1996 while 7 cases were found during the 3-year period of 1997 and 1999. Thus, the number was increased about 8 fold.³

Similarly, our data at Ramathibodi Hospital revealed only 4 cases of T2DM diagnosed during the 10-year period of 1990 to 1999 but 23 cases were found between 2000 and 2005, a 6-year period. The number was increased comparably by about 10 fold. For type 1 DM (T1DM), compared between the former and the latter periods, the numbers were also increased but only by about 2 fold (Fig 1). These data demonstrate that T2DM accounted for 12% of childhood DM during 1990-1999; this number was increased to 40% during 2000-2005, indicating a trend towards an increased frequency of T2DM in children and adolescents in recent years. This new phenomenon brings a serious new aspect to diabetes epidemic in Thai youths. We speculate that the prevalence of T2DM in Thai children and adolescents will be more common than T1DM in the near future. This speculation is based on a rapidly rising trend of T2DM in Thai adolescents and trends seen in other countries. For instance, at present, the prevalence of T2DM is more than T1DM in Japanese children and adolescents.⁴

It is well known that overweight or obesity is the most important risk factor for the development of T2DM in youths. Previous studies demonstrated that the increasing prevalence of overweight closely parallels the rise in the number of cases of T2DM.⁴ This finding indicates a possible causal relationship. Therefore, if the incidence of childhood obesity is continuously increasing, T2DM and its associated complications will emerge at an earlier age (Fig 2). Thus, the future young adult population in Thailand would be burdened with significant morbidity and mortality.^{5,6}

Based on enormous evidence of T2DM in adults, an earlier onset of T2DM leads to earlier onset of complications including: progressive neuropathy, retinopathy leading to blindness, nephropathy leading to chronic renal failure, and atherosclerotic cardiovascular disease leading to stroke and myocardial infarction. There is no doubt that increasing rates of T2DM among children and adolescents will have considerable long-term complications for the affected individuals.

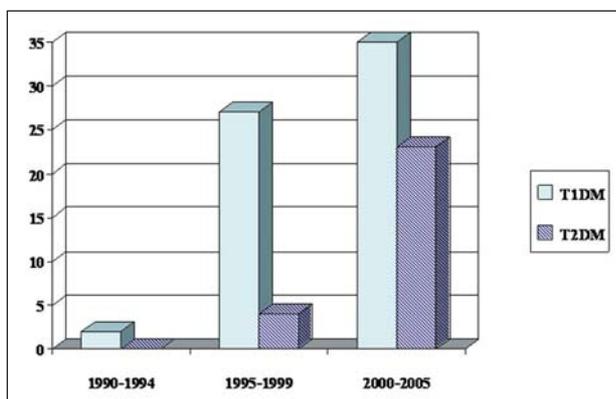


Fig 1. The number of patients with type 1 DM and type 2 DM aged 0-15 years in the Department of Pediatrics, Faculty of Medicine, Ramathibodi Hospital comparing between the year 1990-1994, 1995-1999 and the year 2000-2005 periods.

Early detection of T2DM in the overweight/obese child

Genetic risk factors such as parental T2DM and gestational diabetes are factors increasing susceptibility for developing T2DM in the obese child. However, the accelerated rise of T2DM in the young, particularly obese adolescents during the past few decades cannot be blamed on genetics alone because it is unlikely for the gene pool to change in less than a generation. Apparently, an increased incidence of childhood overweight and obesity is reported in many developed and developing countries including Thailand.⁵

The early phase of T2DM is often asymptomatic. Therefore, screening of at-risk children is necessary for early detection of T2DM. Risk factors for childhood T2DM include positive family history of T2DM, overweight or obesity and signs of insulin resistance including acanthosis nigricans, precocious puberty, hypertension, dyslipidemia and polycystic ovary syndrome.⁵ The suggested guideline for screening childhood T2DM adapted from the American Diabetes Association guideline is shown in Table 1.

During 2000-2005, we have screened 100 moderately to severely obese children, ages 8-18 years, with at least 2 risk factors (Table 1) in Ramathibodi Hospital using oral glucose tolerance test (OGTT). Based on the WHO criteria (Table 2), 20% had impaired glucose tolerance (IGT) and 3% had asymptomatic diabetes. Of those with IGT (n=20), only 1 case had impaired fasting glucose (IFG). Of the remainders with normal glucose tolerance (n=77), none had IFG. This indicates that in screening for

TABLE 1. Suggested guideline for screening childhood T2DM

Criteria
1. Overweight
- BMI > 85 th percentile for age and gender; or
- Weight for height > 85 th percentile; or
- Weight > 120% of ideal for height
2. Plus any 2 of the following risk factors:
- Family history of T2DM
- Signs of insulin resistance and its associated conditions (acanthosis nigricans, hypertension, dyslipidemia, polycystic ovary syndrome)
Age of screening initiation
10 years or at onset of puberty
Test
Oral glucose tolerance test (OGTT)

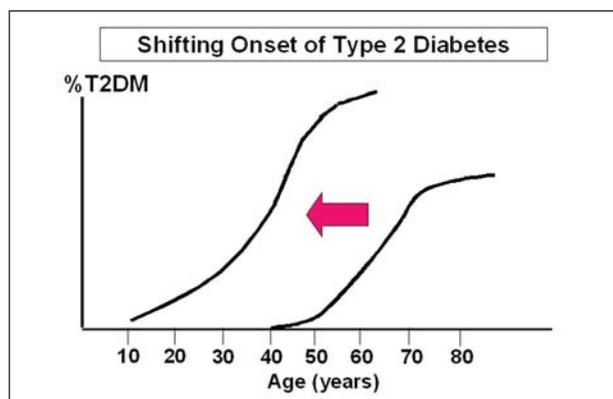


Fig 2. Onset of type 2 diabetes mellitus (T2DM) has been proposed to shift towards an earlier age. It is likely due to the increased prevalence of obesity in children and adolescents in recent years.

abnormal glucose metabolism, OGTT is more sensitive than fasting plasma glucose.

Prevention and treatment options for the child with impaired glucose tolerance or T2DM

The Diabetes Prevention Program demonstrated that among adult patients with IGT, over a 3-year period, a low-fat diet in combination with 150 minutes per week of exercise reduced the risk of developing T2DM by 58% compared with no lifestyle intervention. Also, metformin reduced the risk by 31% compared with placebo group.^{5,6} Unfortunately, the impact of such interventions on children with IGT has yet to be studied.

Nowadays, most Thai children, especially those in urban areas consume large amounts of westernized fast foods, comprised of high fat and sugar, but they consume very little amount of vegetable. In fact, traditional Thai foods that comprise plenty of vegetables, whole-grain carbohydrates and fruits constitute a healthier diet. The problem we are currently facing is that most Thai children in the city do not favor traditional Thai foods and eat very little vegetable. Therefore, parents should be a role model for promoting healthy eating habits. Pediatricians should also encourage low-fat, low-sugar, low-calorie and high-fiber foods. In addition, parents and physicians should promote more physical activities and less sedentary lifestyle. Aerobic exercise for at least 30 minutes per day should be encouraged, with gradual increase in the frequency, intensity, and duration of exercise according to each individuals fitness level and goals.

CONCLUSIONS

At present, the increased incidences of childhood obesity and T2DM are mainly due to overnutrition and sedentary lifestyle. The fall in the age of onset of T2DM is an important factor influencing the future burden of the disease. The full range of both microvascular and macrovascular complications will occur when affected individuals are still relatively young. Thus, the future generations of Thai population may be burdened with significant morbidity and mortality, potentially affecting the workforce and healthcare systems of Thailand. It is time to alert parents, societies, organizations

TABLE 2. Plasma glucose criteria for the diagnosis of impaired glucose tolerance and diabetes

Plasma glucose (PG) (mg/dL)	Normal	Impaired	Diabetes
Fasting	< 100	100-125 (IFG)	> 126
Oral glucose tolerance test (2 h PG)	< 140	140-199 (IGT)	> 200
Casual			> 200 + *

IFG, impaired fasting glucose; IGT, impaired glucose tolerance;
2 h PG, plasma glucose at 2 hours post-ingestion of glucose;

*Polyuria, polydipsia, weight loss

and the Thai government to strengthen intervention programs and introduce policies including health food habits, optimal physical activity and exercise, early prevention, detection and intervention of obesity and T2DM in order to reduce the related morbidity and mortality of the young adult Thai population in the near future.

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