

Diabetes in Thailand: Status and Policy

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Abstract Like other countries in the Western Pacific region, Thailand is facing increasing numbers of patients with diabetes due to unhealthy diets, high obesity rates, and an aging society. Diabetes is a considerable burden for developing countries as it reduces quality of life, increases mortality, and drives up healthcare costs. The disease detection rate in Thailand has improved in recent years, but glycemic control remains suboptimal and significant numbers of patients suffer from complications. Universal healthcare coverage has increased access to care, but inequality exists between different health plans and non-medication diabetes supplies are not yet widely covered. Diabetes self-management education has not yet been standardized and a multidisciplinary team approach is not widely utilized. The Thai government recognizes the burden of diabetes and has launched nationwide programs of health promotion and disease prevention. In addition, local initiatives have targeted reductions in specific complications, including retinopathy and diabetic foot problems, which has resulted in better disease prevention and treatment. Along with strategic public health planning,

increased collaboration between private and public sectors, enhanced professional training, increased use of technology and data management, and equitable distribution of care are all needed to improve outcomes of patients with diabetes in Thailand.

Keywords Diabetes · Thailand · Policy · Glycemic control · Complications · Healthcare cost

Introduction

Thailand is located in Southeast Asia and is considered a developing country with an upper middle income level [1]. In 2014, the country's population was 67.2 million. The poverty level has steadily dropped in recent years, from 20.5 % of the population in 2008 to 12.6 % in 2012. Life expectancy was estimated to be 74 years in 2014 and has been slowly increasing [1]. The extension in life expectancy has contributed to changes in the age distribution of the population, with a rise in the proportion of individuals over 65 years of age from 7.7 % in 2005 to 10.1 % in 2014 [1]. As a result, disease patterns and causes of death have shifted toward non-communicable diseases (NCDs). In 2005, stroke (10.7 %) and ischemic heart disease (7.8 %) were the leading causes of death, followed by HIV/AIDS (7.4 %) [2]. Diabetes was the 10th cause of death among males (3.3 %) but ranked 3rd among females (8.2 %). When focusing on individual 50–74 years of age, diabetes was the leading cause of death among females, accounting for 12.3 % [2].

This review will summarize the current status of diabetes in Thailand, including the disease burden and the country's policy. Future perspectives will also be discussed.

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Disease Status

Prevalence and Incidence

The prevalence of diabetes has increased in the last three decades. In 1991, the estimated prevalence of diagnosed diabetes was 2.3 % [3••]. Several large-scale or national surveys have been conducted since then. In 2000, the InterASIA study surveyed 5015 adults (age ≥ 35) and found an estimated diabetes prevalence of 9.6 % (50 % of whom were undiagnosed) and impaired fasting glucose (IFG) prevalence of 5.4 % (using fasting plasma glucose, FPG, 110–125 mg/dL) [4]. Subsequently, the National Health Examination Survey (NHES) conducted in 2004 in 37,138 individuals aged ≥ 15 found an overall diabetes prevalence of 6.7 % (55 % of whom were undiagnosed), with IFG prevalence of 12.5 % [5]. The NHES was repeated in 2009 (18,629 individuals) and revealed a slightly higher diabetes prevalence of 7.5 %, but the percentages of those undiagnosed with the disease had declined to 31 %, reflecting better detection rates [6••]. IFG prevalence remained relatively stable at 10.6 %. Both NHESs revealed a slightly higher prevalence in women than men and in those residing in urban compared with rural areas. Percentages of undiagnosed diabetes were also higher in men than in women. It is important to note that NHESs utilized diabetes criteria of FPG ≥ 126 mg/dL on one occasion, or previously diagnosed diabetes and intake of hypoglycemic drugs, but not hemoglobin A1c (HbA1c) values or results of an oral glucose tolerance test (OGTT). Thus, the prevalence of diabetes has likely been underestimated.

The aforementioned prevalence studies did not specify diabetes type. Based on other registry studies, we can reasonably assume that the vast majority of cases in Thailand are type 2 diabetes. The Thailand Diabetes Registry (TDR), conducted in 11 tertiary care centers in 2003 involving 9419 patients with diabetes, found the prevalence of type 1 diabetes to be 5.4 % (with 2.07 % being children) [7, 8•]. Another survey of 37 primary healthcare centers (1078 patients with diabetes) also found a similar prevalence of 6 % [9].

In children, there is also concern regarding the rising prevalence of type 2 diabetes. One study conducted in an academic medical center found that the prevalence of type 2 diabetes among children with diabetes was 5 % from 1986–1995 and rose to 17.9 % during 1996–1999 [10]. This occurred in parallel with an increase in obesity prevalence [10].

For incidence of type 2 diabetes, a few studies were conducted between 1985 and 2005 (with a follow-up period between 4–12 years). These revealed an incidence of 11.3–11.4 per 1000 person-years (PYs) [11, 12], with the most recent study (2001–2005) showing an incidence of 13.6 and 6.4 per 1000 PYs in men and women aged >35 years, respectively [13]. For incidence of type 1 diabetes, surveys have been periodically performed since 1984 using questionnaires sent to

regional hospitals, focusing on the pediatric population only. The incidence has slowly risen, from 0.15/100,000/year in 1984 [14] to 0.3/100,000/year in 1991–1995 [15] and to 0.6/100,000 in 1996–2005 [16]. The incidence varied slightly between regions in the country, with the highest incidence in Bangkok: 1.65/100,000/year from a survey in 1991–1995 [17]. This incidence of type 1 diabetes in children is considered very low compared with that of Western nations. For example, in the USA, the incidence was 27.4/100,000/year in 2009 while it was 64.2/100,000/year in Finland in 2005 [18, 19].

Glycemic Control

Glycemic control in patients with type 2 diabetes in Thailand remains suboptimal, although there has been a trend of improvement over the years. In the most recent data, 77.6 % of patients living with diabetes received HbA1c testing at least once a year [22•]. In 1998, only 20 % of the patients met the glycemic goal of HbA1c <7 %, while this number increased to 26.3 % in 2003 and to 35.6 % in 2014 in the most recent survey, conducted by the National Health Security Office (NHSO). The NHSO insures most of the Thai population through universal healthcare coverage [20–22•] (Table 1). Some surveys have utilized FPG, not HbA1c, as a marker of glycemic control, and these surveys have yielded a higher proportion of patients considered under good control (FPG <140 mg/dL) [5, 6••]. The status of glycemic control of patients with type 1 diabetes is not well studied, but existing data suggest inadequate control. Mean HbA1c from several small studies ranged between 8.9–9.6 % (Table 1) [7, 23••, 24, 25].

Hypertension and Hypercholesterolemia

Hypertension and hypercholesterolemia are prevalent and the control of these comorbidities has improved but remains inadequate. Compared with 2004, the NHES in 2009 revealed that the percentage of patients with diabetes whose hypertension is well controlled (blood pressure $<130/80$ mmHg) increased from 3.4 to 12.2 % in men and from 6.4 to 13.8 % in women [5, 6••]. The TDR (2003) found a similar percentage of 13.8 % [26]. Data from the NHSO in 2014 (33,288 patients) indicated that 50.3 % had blood pressure $\leq 130/80$ mmHg, although only 20.5 % of the patients had met this goal during three consecutive visits in the preceding 12 months [22•].

A similar trend is seen for patients with diabetes who have hypercholesterolemia. Only 4.0 % of men and 3.8 % of women were being adequately treated (total cholesterol ≤ 200 mg/dL) in 2004 [5]; this increased to 16.3 and 17.3 %, respectively, in 2009 [6••]. In 2003, the TDR found that more than 80 % of the patients had dyslipidemia, but only 55 % had received treatment [27]. Among those treated, only 40.1 % had reached the goal of LDL <100 mg/dL. In 2014, data from the NHSO revealed that only 43.7 % of patients with type 2 diabetes had

Table 1 Glycemic control status in Thai patients with diabetes

Study, year	Diabetes type	Number	Mean HbA1c (SD) (%)	Percentage of patients under good glycemic control
Diabcare-Asia, 1998 [21]	Majority type 2	2568	8.6 ± 1.9	20 % had HbA1c <7 %
Thailand Diabetes Registry, 2003 [20]	Type 2	8913	8.1 ± 1.8	26.3 % had HbA1c <7 %
National Health Examination Survey, 2004 [5]	Majority type 2 (diagnosed and treated)	1043	NA	41.6 % had FPG <7.8 mmol/L
National Health Examination Survey, 2009 [6]	Majority type 2 (diagnosed and treated)	1504	NA	43.3 % had FPG <7.8 mmol/L
National Health Security Office, Thailand, 2014 [22•]	Type 2	33,288	Not reported	37.9 % had FPG 70–130 mg/dL (performed in 91 %) 35.6 % had HbA1c <7 % (performed in 77.6 %)
Type 1 Chulalongkorn Hospital, 2001–2013 [23]	Type 1 (pediatric)	92	9.6 ± 2.2	
Type 1 Siriraj Hospital, 2003–2004 [24]	Type 1 (pediatric)	130	8.9 ± 2.1	
Thailand Diabetes Registry, 2003 [7]	Type 1 (pediatric)	195	9.3 ± 2.5	17 % had HbA1c <7 %
Thailand Diabetes Registry, 2003 [52•]	Type 1 (all ages)	347	9.2 ± 2.5 (those with diabetic retinopathy) 9.0 ± 2.3 (those without retinopathy)	

LDL levels <100 mg/dL [22•]. The proportion of patients meeting glycemic, blood pressure, and LDL cholesterol goals was only 6.1 %, a figure which had remained stable over the previous 5 years [22•].

Complications

The prevalence of retinopathy and nephropathy in some of the larger studies is shown in Table 2. The results varied slightly, according to the study setting and diagnostic criteria, but consistently showed that at least one quarter of the patients had these complications.

For diabetic foot problems, the prevalence ranged between 15–26 %, with some reports citing levels as high as 40 % [28–30]. While a minority of patients had a history of lower extremity amputation (0.9 % for right foot and 0.6 % for left foot) or active ulcers (3.2 % for right foot and 1.9 % for left foot), up to 22 % were found to have a high-risk foot during a comprehensive foot examination, and 5.9 % had a history of foot ulcers [29, 31].

The above figures could be underestimated, as screening was not universal. For example, data compiled by the NHSO in 2014 revealed that 57.4 % of the patients had a urine albumin test, 65.9 % had a retinal exam and 66.6 % had a comprehensive foot exam, while only 20.2 % had all the screenings plus HbA1c testing at least once in a 12-month period [22•].

For macrovascular complications, ischemic heart disease and cerebrovascular disease were found in 8.5 and 4.5 % of patients with type 2 diabetes and 1.6 and 1.4 % of patients

with type 1 diabetes, respectively [8•]. Another study conducted at a university hospital found much higher prevalence of 28.9 and 10.6 %, respectively [28].

Cost of Care

Several studies have estimated the direct medical costs of diabetes care in Thailand. A study conducted in 2007–2008 including 475 patients found that the median cost for patients without complications was \$115 yearly but was \$479 for those with complications [32]. This increased to \$4891 among those who were severely disabled, exceeding the income per capita of \$4118. In a larger study of 24,501 patients in 2002–2003, the average cost of care was \$551 and about 21 % required hospitalization during the survey period [33]. The predictors of higher care cost included older age, presence of complications and co-morbidities, insulin use, and care at university hospitals [33]. The average spending per admission in a tertiary care hospital in Bangkok (2005–2008) was estimated at \$1682 [34]. These numbers, however, do not reflect the bigger picture of economic loss related to diabetes care. A study of data collected in 2007–2008 found that while the average yearly spending per patient was \$200 for direct medical costs, the direct non-medical costs (i.e., transportation, food, accommodation) accounted for another \$351 and the indirect non-medical costs (i.e., loss of income, disability cost) for another \$330, totaling \$881, which was approximately 20 % of the income per capita [35•].

Table 2 Prevalence of micro- and macrovascular complications

Study	Number	Setting	Retinopathy	Nephropathy
Thailand Diabetes Registry 2003 [8•]	9419	11 medical centers	Type 2 diabetes: NPDR 22 %, PDR 9.4 % Type 1 diabetes: NPDR 10.9 %, PDR 10.6 %	Type 2 diabetes: microalbuminuria 18 %, proteinuria 17.8 %, serum creatinine ≥ 2 mg/dL 8.3 % Type 1 diabetes: microalbuminuria 15 %, proteinuria, 19.7 %, serum creatinine ≥ 2 mg/dL 9.7 %
Jongsareejit et al. 2006 [53]	1120	7 public hospitals	Retinopathy 24 % Mild NPDR 9.4 %, moderate NPDR 10.5 %, severe NPDR 1.3 %, and PDR 2.8 %	A subset of the patients were evaluated for nephropathy ($n = 877$) [54] Microalbuminuria 26 % Macroalbuminuria 11.2 %
Sriwijitkamol et al. 2006 [28]	722	Siriraj Hospital (university medical center)	Only 38.4 % had eye exam by ophthalmologist Prevalence of DR was 31.2 %	42 % screened for nephropathy, and 83.5 % had serum creatinine measured Diabetic nephropathy 37 % Chronic kidney disease (stage 3) 48.2 %
Mayurasakom et al. 2009 [55]	287	13 primary care units	DR 15.1 %	Microalbuminuria 28.7 % Macroalbuminuria 5.7 %
Phoksunthorn et al. 2007 [56]	201		DR 26.3 %	Macroalbuminuria 14.4 %
Supapluksakul et al. 2008 [57]	714	Trang Province	NPDR 19.2 % for the left eye and 18.5 % for the right eye PDR 1.1 % for the left eye and 1.3 % for the right eye	
Silpa-Archa et al. 2011 [58]	261	Royal Thai Air Force Hospital	DR 25.7 % (NPDR 23.4 % and PDR 2.3 %)	
Jenchitr et al. 2002 [59]	3049	Lampang Province	NPDR 18.9 % PDR 3 %	
Narenpitak et al. 2007 [60]	716	Primary health unit, Udon Thani Province		Chronic kidney disease (stages 3–5) 25.3 % by MDRD formula
National Health Security Office 2014 [22•]	33,288	Nationwide		Nephropathy (albuminuria, proteinuria, or chronic kidney disease) 29.7 %

Microalbuminuria urine albumin/creatinine <30 to 300 $\mu\text{g}/\text{mg}$, *macroalbuminuria* urine albumin/creatinine >300 $\mu\text{g}/\text{mg}$, *DR* diabetic retinopathy, *NPDR* non-proliferative diabetic retinopathy, *PDR* proliferative diabetic retinopathy, *MDRD* modification of diet in renal disease

Healthcare Coverage

Universal healthcare coverage (UC) was established in 2002, and by 2013, it was claimed that 99.87 % of the Thai population was covered [36]. Other major health coverages include the social security scheme (SS), which is offered to employees (with contributions from employees and employers), and the civil servant medical benefit scheme (CS) for government officers. In 2013, 74.7 % of the population utilized benefit coverage from UC, 16.6 % from SS, and 7.6 % from CS. Another 0.16 % were covered under other local administration organization schemes, 0.13 % were non-registered, and 0.75 % were other types (i.e., out-of-pocket or private insurance) [36]. These schemes, especially UC and CS, are available almost exclusively in government hospitals run by the Ministry of Public Health.

As a result of UC, patient out-of-pocket healthcare costs significantly declined in the poorest group (10th decile), from

8.17 % of their household expenditure in 1992 to 1.89 % in 2009, while the numbers remained relatively stable for the richest group during the same period (1.1 to 1.4 %). Total national healthcare spending was approximately 4.2 % of the gross domestic product in 2011, a slight increase from 3.3 % in 1994, but the proportion of government spending increased significantly, from 44.5 % in 2004 to 77.3 % in 2011, an average of \$222 per capita.

The coverage of major health insurance schemes includes outpatient visits and medication cost, and inpatient stays. However, the coverage differs according to the scheme, with CS generally providing broader medication coverage than SS and UC. Table 3 provides an example of medication coverage in one university hospital in Bangkok [37]. Patients under CS coverage have access to both essential drugs (ED) and non-essential drugs (NED). However, those under SS and UC only have access to ED. For NED, patients either have to pay out-of-pocket or receive special approval from the hospital

Table 3 Examples of diabetes medication coverage in a university hospital in Bangkok

Medication	Coverage
Sulfonylurea	
Glipizide	ED
Glibenclamide	ED
Glimepiride	NED
Gliclazide	NED
Metformin	
Metformin (generic)	ED
Glucophage XR	NED
Pioglitazone	ED
α -Glucosidase inhibitor	
Acarbose	ED
Voglibose	NED
Glitinide	
Repaglinide	ED
Dipeptidyl peptidase IV inhibitor	
Sitagliptin	NED
Linagliptin	NED
Saxagliptin	NED
Glucagon receptor agonist	
Exenatide	NED
Liraglutide	NED
Human insulin	
NPH, regular insulin	ED
Humulin 70/30	ED
Sodium–glucose cotransporter 2 inhibitor	
Dapagliflozin	NED
Insulin analog	
Aspart	ED
Lispro	NED
NPH/Lispro 75/25	NED
Aspart protamine/Aspart 70/30	ED
Glargine	ED
Detemir	NED

ED essential drug, NED nonessential drug

administration. In addition, decisions regarding what drugs are ED or NED are not consistent across hospitals, as local administrators play a role in coverage decisions. Drug classes such as dipeptidyl peptidase IV inhibitors, sodium–glucose cotransporter 2 inhibitors, and glucagon receptor agonists are typically NED. As a result, patients under SS and UC who fail to respond to a combination of sulfonylurea and metformin (\pm pioglitazone) usually will have to start insulin injections. Another major problem is that none of the diabetes monitoring supplies (including glucometers, test strips, and lancets) are currently covered under any insurance scheme. Thus, many patients cannot afford these items.

While a recent study done in Thailand demonstrated the cost-effectiveness of home self-monitoring of blood glucose in patients with type 1 diabetes [38], coverage has been lagging behind. Other more advanced diabetes technologies, including an insulin pump and continuous glucose monitoring, are not covered by any schemes. The cost of an insulin pump, approximately \$2200 with ongoing monthly supplies of \$150, is out of reach for a majority of the patients in Thailand. Not surprisingly, an insulin pump is used by only about 60 Thai patients in the country (personal communication, 2015), while the majority of pump users are expatriates.

It is worth mentioning that UC includes treatment of conditions considered complications of diabetes, including peritoneal and hemodialysis as well as renal transplantation along with antirejection medications. On the other hand, UC has not provided similar levels of financial support for disease prevention and treatment. For example, a diabetes education program is currently not a well-established entity and not a reimbursable service (discussed below).

Other Diabetes-Related Programs

Besides regular healthcare, several local initiatives to battle diabetes have been implemented. Some examples are summarized below.

Mobile Eye Clinic

A collaborative effort involving the Ministry of Public Health, the World Diabetes Foundation, and the Danish Embassy in Thailand to provide treatment and raise awareness about diabetes and diabetic retinopathy in rural communities began in 2009 and ended in 2011. This program helped equip two mobile eye clinics, trained 1748 healthcare personnel, and provided free laser treatment to 14,943 patients [39].

Type 1 Diabetes

Another project, to provide comprehensive care for patients with type 1 diabetes, was initiated in 2011 on the occasion of celebrating King Bhumibol Adulyadej's 84th birthday [40]. This included 84 patients who were provided insulin glargine and insulin glulisine by Sanofi-Aventis, along with free glucose test strips and diabetes self-management education (DSME) during their participation in diabetes camp. Involved healthcare professionals participated in the training. After 3 years, HbA1c levels for the overall population decreased non-significantly (8.6 vs 8.4 %, $p=0.057$), but among those who were >18 years of age, there was a significant reduction (7.9 vs 7.7 %, $p=0.031$), and more participants had HbA1c <7.5 % (18.3 vs 24.5 %). Severe hypoglycemia decreased,

frequency of self-monitoring of blood glucose increased, and participants had a better understanding of diabetes self-management.

The NHSO has begun to recognize the importance of type 1 diabetes care. In 2015, it appointed a task force to target this disease by means of increased coverage of medications (i.e., insulin analogs) and diabetes supplies, along with comprehensive diabetes self-management education and support for patients and healthcare professionals. This is a pilot project, with the expectation of system-wide application if the results are favorable.

Foot Care

Historically, podiatry training in Thailand has not been available, with serious diabetic foot problems being taken care of by surgeons or orthopedists. In 2007, the World Diabetes Foundation collaborated with Theptarin Hospital in Bangkok, the first diabetes center in Thailand, to start mass training for foot care professionals [41]. In addition, a knowledge management forum, a footwear modification shop, and other educational tools were arranged. As a result, 231 healthcare professionals were trained, one knowledge management forum was conducted, and three special footwear machines were set up. Additional training of over 2000 personnel was achieved through 2015, independent of funding from the World Diabetes Foundation. In 2013, the NHSO also began utilizing this program for their training. In a 2015 NHSO report on care outcomes in 32,596 patients, foot care showed a significant improvement from 2010, with increased rates of comprehensive foot exams (44.8 to 67.1 %), decreased foot ulcer (2.2 to 1.7 %) and amputation rates (0.5 to 0.1 %), and increased foot care education for patients at least yearly (39.5 to 71.1 %) [42].

Diabetes Prevention

The only formal diabetes prevention program in Thailand is in the form of research. This is a community-based diabetes prevention initiative funded by the International Diabetes Federation to test a pre-designed knowledge management program to prevent or delay the onset of type 2 diabetes by randomizing 2240 people with a high risk of diabetes in 32 primary care units from 2012–2015 [43]. The results are expected soon.

Other health promotion programs have been implemented since 2008 through the Thai Health Promotion Foundation to spread knowledge about the benefits of healthy eating and exercise at a community level and in workplaces. There has not yet been a formal evaluation of the outcomes of these programs [44].

Diabetes Policy

Thailand's National Health Development Plan is a part the National Economic and Social Development Plan which was initiated in 1961, with each plan spanning a period of 5 years. Diabetes is recognized as one of the non-communicable diseases (including hypertension, cancer, cerebrovascular disease, and heart disease), the so-called NCDs, which have increasingly become a burden on the country. NCDs are categorized as lifestyle diseases, and targeting their threats was incorporated as one of the major development goals of the 10th National Economic and Social Development Plan (2007–2011). The concept of "health" has been extended to cover physical, mental, social, and spiritual dimensions, and the term "well-being" is now used to reflect this concept. Following this period, the government established the Thailand Healthy Lifestyle Strategic Plan to cover the course of the 11th National Economic and Social Development plan (2012–2016) and beyond [45]. The following section will summarize the situations affecting health development and future strategies with a focus on NCDs and diabetes, as well as expected hurdles and remaining gaps.

Situations and Factors Affecting Health and Development

Besides global changes—including environmental factors, an aging society, food security, and technological advances which affect the population's health—Thailand has its own specific problems.

For the population as a whole, unhealthy behaviors and overweight/obesity contribute to some of the lifestyle diseases. For example, a NHES survey in 2004 found that the average fruit and vegetable consumption was 3.24 servings/day and only 25 % of the population consumed ≥ 5 servings/day [46]. In 2007, consumption of sugar was found to be 36.4 kg/person/year, which exceeded the standard amount recommended by the World Health Organization (15–20 kg/person/year), while 25 % of the population aged 6 and older consumed soft drinks and sweetened drinks on a daily basis [47]. With a more metropolitan lifestyle, 80 % of people in the Bangkok area consumed food outside the home, mostly from street vendors, which could be associated with contamination and high fat/sugar and salt contents [47]. In addition, the rate of obesity has been rising. In 2008–2009, 34.7 % of the population aged 15 and older were found to be overweight or obese (BMI ≥ 25 kg/m²), with a steadily increasing trend since 1991 of approximately 0.95 kg/m² per decade [48].

The medical workforce is currently inadequate, with a ratio of 1 physician per 2428 population, whereas the ratio needed is 1:1500 to 1:1800 [47]. Also, the workforce distribution is unequal, with only 50.4 % of physicians working for the Ministry of Public Health, which provides more than 80 % of healthcare for the entire population. This could be part of

the reason, along with lower pay and increasing litigation, that a significant number of physicians have moved from government to the private health sector. Similar shortages are seen with dentists, pharmacists, and nurses. The shortage of human resources might also play a role in the medical system focusing more on treatment rather than health promotion and disease prevention.

In addition, the budget allocation to healthcare facilities, based on the capitation principle (amount paid to hospitals per capita) of the UC scheme, was lower than the actual healthcare costs. This resulted in financial constraints of the hospitals, as it was estimated that only 48 % of the actual hospital spending was received as compensation from the government in 2010. Consequently, hospitals had to find ways to control their spending. Combined with doctor shortages and an inability to expand the number of beds, this led to full bed occupancy situations and admission/referral refusals, and eventually to inequalities in the healthcare system.

Moreover, the budget allocation for health promotion and prevention has been relatively small, given the country's NCD burden [47]. In 2006–2007, only 4.8 % of national health spending was directed toward health promotion and disease control. As a result, the NHSO has established a 5-year program (2012–2016) to increase the budget allocation to 9.5 % and eventually to 20 % in 2016. Along the same lines, the effort to decentralize healthcare to local facilities was started in 2009 by upgrading 2000 health centers to subdistrict hospitals (run by nurses, with no inpatient beds) focusing on health promotion, disease control, treatment, rehabilitation, and consumer safety. These healthcare units work closely with district hospitals to coordinate overall patient care. At the same time, the role of village health volunteers was also promoted by offering a small monetary compensation. In addition, during 2011–2014 the Ministry of Public Health trained 1064 nurse case managers as a part of service plans for diabetes and other chronic diseases [49]. These efforts reflect attempts to deal with the growing epidemic of chronic diseases, including diabetes.

Lastly, inequalities among health plans exist. Medication coverage differs between plans, as previously stated. The Thailand Development Research Institute (TDRI) recently reviewed outcome differences between those covered under UC and CS, based on 2 years of completed data [50]. When comparing elderly who died from one of the five leading NCDs (cancer, stroke, hypertension, diabetes, and heart disease), those covered under CS had better access to healthcare and lower in-hospital mortality rates, but higher healthcare spending despite being less ill. When focusing on diabetes, inpatient spending was not related to mortality, but households that spent more out-of-pocket on healthcare, and consumed less starches/meat/sugars and more fruits/vegetables, had lower mortality. However, the analysis did not include outpatient spending, which could potentially be an important factor

given the chronic nature of diabetes. These data reflect healthcare inequalities, which could be due to the actual health coverage itself or possibly demographic differences among those covered under UC vs CS. Regardless, this matter should be urgently addressed.

Future Strategies

The 11th National Health Development Plan [47] listed five main strategies, including the following:

1. Strengthen partners for health promotion and self-reliance in health with Thai wisdom
2. Further develop systems for monitoring, warning, and managing disasters, accidents, and health threats
3. Focus on health promotion, disease prevention, and consumer protection in health for Thais to be physically, mentally, socially, and spiritually healthy
4. Improve the healthcare system by maintaining higher quality and standards at all levels in response to the health needs of all age groups and develop seamless referral systems
5. Create national mechanisms for enhancing the efficiency of healthcare system governance and resource management

Along with these strategies, the Thailand Healthy Lifestyle Strategic Plan also focuses on health promotion in attempting to reduce risk behaviors contributing to diabetes and poor glycemic control [45]. The plan's strategies involve creating public policy, increasing public communication, increasing awareness at the community level, creating a surveillance and care system for the at-risk population, and building capacity to create capable organizational leaders and personnel in order to manage and implement these plans at all levels. Part of the implementation is conducted through a service plan of the Ministry of Public Health. In 2015, the key performance indices (KPI) specifically focusing on diabetes include increasing the rate of good glycemic control (goal of 40 %, with a baseline in 2014 of 23.8 %), decreasing the number of new patients with diabetes, and applying universal diabetes screening in the elderly [51].

Expected Hurdles and Remaining Gaps

As stated in future strategies, the country has overarching goals of achieving better health promotion, disease prevention, and patient care, along with improved outcomes. This will require seamless collaboration and understanding among many public and private organizations, from the top administrators down to local personnel and communities. The lack of clarity of the policy and strategies, inappropriate agencies chosen to implement the strategies, and lack of organizational

support for some strategies have all been recognized as hurdles. In addition, more specific action plans are likely needed to achieve outcomes. Complete data collection, which only recently started on the process and outcomes, is a key factor to improve further planning [51]. Lack of appropriate space, medical equipment, and technology also has hampered the implementation of the service plan by the Ministry of Public Health [51].

In terms of personnel development, it should be noted that Thailand does not have its own “diabetes educators” who are certified. Most diabetes self-management education is performed by nurses or other health personnel, but there is no uniformity of the curriculum. There are currently no guidelines or audits for diabetes education programs, and the concept of a multidisciplinary team approach is not widespread. Diabetes nurses often have to perform other nursing duties and cannot devote their time to diabetes alone. Most physicians who are treating diabetes are general practitioners whose training in medical school may have focused more on acute rather than chronic care. These are issues which need to be addressed in order to deliver quality care for this chronic disease, in which self-management also plays a key role in success.

Care equality and coverage could certainly be improved—for example, considering diabetes education to be a reimbursable service and recognizing “diabetes educator” as a profession. In addition, as much as diabetes is often thought of as a lifestyle disease, policy makers should be aware that for those with diabetes, lifestyle modifications alone will not cure the problem. Therefore, coverage of diabetes supplies—including test strips, glucometers, and injection supplies, along with some of the newer medications and technologies—would be a key factor in reducing disease burden and severity. Fair and equal distribution of funding to local hospitals is also essential to ensure quality care for patients with diabetes.

Lastly, there is no disability act in Thailand; hence, there is no systemic information on the discrimination and difficulties that patients with diabetes face in their daily lives. From personal experience, these problems do exist, including, but not limited to, diabetes care at schools and workplaces. This will need to be addressed to improve the quality of life of these patients.

Lessons Learned from Thailand

There are lessons to be learned from diabetes care in Thailand as a country with inadequate and sometimes misallocated resources. Having universal healthcare coverage significantly improved access to care and health screening as well as facilitated national data collection for future planning. However, universal coverage has not eliminated problems with quality of care and access to specific services, particularly preventive and self-management services. Utilization of non-professional healthcare volunteers, especially at the local levels, helped

promote health screening, communications and simple health status monitoring without significant added cost. Initiatives supported by the private sector, non-for-profit organizations, and international organizations have helped to propel foot care and digital fundoscopy into the mainstream of diabetes care. These components of diabetes care were then eventually incorporated into the national level by the NHSO. This recent history may serve as a practical model for introducing other new forms of diabetes prevention and treatment and gaining support from national payers.

Conclusion

Diabetes is a significant disease, contributing to decreased quality of life as well as increased mortality and healthcare costs in Thailand. The country recognizes this burden and has begun to tackle the problem from multiple angles. Collaborations among interested organizations and clear strategies with effective implementation, along with clear outcome measurements, are needed. Education of the public, healthcare professionals, and physicians is also necessary to promote understanding of the disease, for both self-care and healthcare alike. Lastly, improved healthcare equality and coverage should result in improved disease outcomes for patients with diabetes.

Compliance with Ethical Standards

Conflict of Interest Sirimon Reutrakul reports grants from Merck and personal fees from Sanofi and Medtronic. Chaicharn Deerochanawong declares that he has no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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