A Survey Study on Diabetes Management and Complication Status in Primary Care Setting in Thailand

Wannee Nitiyanant MD*, Thanya Chetthakul MD**, Pensiriwan Sang-A-kad MD***, Chaiyaporn Therakiatkumjorn MD****, Kemarasami Kunsuikmengrai MD***** , Jing Ping Yeo******

* Siriraj Hospital, Bangkok, ** Maharat Nakhon Ratchasima Hospital, Nakhon Ratchasima
*** Ratchaburi Hospital, Ratchaburi, **** Hatyai Hospital, Hat Yai, Songkhla
***** Nakornping Hospital, Chiang Mai, ****** Novo Nordisk Asia Pacific Region

Objective: Healthcare service in Thailand is stratified into three levels with different facilities of care. This cross-sectional survey study described diabetes management, diabetes control, and late complication status among patients managed in urban primary health care clinics.

Material and method: Thirty-seven primary health care units were randomly selected. Each unit enrolled up to 30 patients having been managed in the unit for at least one year. The patients were interviewed, and the medical records such as demographic data, management practice, glycemic control, and complications were retrospectively reviewed for a period of one year. All data were entered in the case record forms, transferred into a database by electronic scanning, and analyzed by SAS version 6.12. One thousand and seventy-eight patients, including 300 males and 778 females, were recruited in the present study.

Result: Their mean ± SD of age, onset age, and diabetes duration were 58.2 ± 11.3, 52.2 ± 11.4 and 6.2 ± 4.0 years, respectively. Six percent of the patients were type 1, and 94% were type 2 diabetes. Two-thirds of the patients engaged in diabetes education > 5 days during the previous year. Monitoring of glycemic control was largely by measurement of fasting plasma glucose (FPG) in the unit. Determination of hemoglobin A1c (HbA1c), total cholesterol, triglyceride, HDL-cholesterol, serum creatinine, urinary protein, and microalbuminuria were observed in 0.7, 17.4, 11.7, 6.9, 38.2, 33.0, and 0.9% of the patients, respectively. Mean ± SD of FPG was 8.3 ± 2.7 mmol/l, and HbA1c was 8.6 ± 1.9%. The percentage of patients with FPG < 6.7 mmol/l and HbA1c < 7% were 28.7 and 19.6%, respectively. An annual eye and foot examination was performed in 21.5% and 45% of the patients, respectively. The prevalence of late complications included retinopathy (13.6%), proteinuria (17.0%), end stage renal failure (0.1%), peripheral neuropathy (34%), acute foot ulcer/gangrene (1.2%), healed foot ulcer (6.9%), stroke (1.9%), and myocardial infarction (0.7%).

Conclusion: The present study results demonstrated that necessary, routine assessments were not regularly practiced by caregivers in primary care units. In addition, peripheral neuropathy was the most common observed complication and this might explain the high rate of foot ulcers in this cohort.

Keywords: Diabetes mellitus, Primary healthcare, Treatment, Diabetic complications, Thailand

Diabetes mellitus (DM) is a common chronic disease with increasing burdens in Thailand. The prevalence of diabetes in Thai adults aged 35 years or older rose to 9.6% during the year 2000(1). However, the DM patterns remain unchanged from a previous survey(2) in that it is more prevalent in female groups and especially in urban areas. Diabetes frequently affects the population aged 45 years and older(3). Diabcare-Asia (Thailand) is a part of Diabcare-Asia Project(4) designed to gather the data on diabetes management and outcomes in Asia. The Diabcare-Asia (Thailand) surveys in 1997 and 1998 demonstrated that diabetic care and control were sub-optimal in more
than one half of the patients attending diabetic clinics in 26 secondary/tertiary care hospitals around the country\(^4,5\). Meanwhile, the data on diabetes care management outcomes and complications in primary care settings are not yet available. This Diabcare-Asia (Thailand) survey in 2001 was designed to describe the diabetes management and control as well as late complication status in the patients with DM managed in primary health care units in urban areas.

**Material and Method**

**Study design**

A cross-sectional survey study was designed by Diabcare-Asia Steering Board\(^3\), consisting of representatives from national diabetes association in each participating country, International Diabetes Federation, WHO Collaboration Center, Australia and Medical Director of Novo Nordisk Asia Pacific Center.

Eight provincial hospitals were randomly selected to represent each of the four regions in Thailand. In the vicinity of each provincial hospital, 4-5 district hospitals providing primary health care service were invited to participate in the present study. An investigator meeting was set up for each region to provide understanding and clarification on data entering in the case record form. The technique of collecting capillary blood for measurement of hemoglobin A\(_1c\) (HbA\(_1c\)) was demonstrated and practiced.

**Study population and data collection**

Each participating unit enrolled up to 30 diabetic patients who had been under care in the unit for at least one year. Simple randomization was used for the enrollment. The patients were interviewed for diabetes education exposure and self-care pattern. Their medical records including demographic data, management practice, glycemic control, and existing recorded complications were retrospectively reviewed for one year. The definitions were described in the previous publication\(^4\) and criteria of control were based on the published recommendations\(^6,8\). There were no special tests done in the present study, except blood samples by finger prick at the recruitment for HbA\(_1c\) measurement. HbA\(_1c\) was determined by Bio-Rad assigned central laboratory, using automated high-pressure liquid chromatography. All samples were stored at 2-8\(^\circ\)C and mailed by batches to the appointed central laboratory. All data were entered in the case record forms.

**Statistical analysis**

The data in the case record forms were transferred to a database (Microsoft Excel) by electronic scanning (Teleform Elite, version 7; Cardiff Software Inc, SAS Institute Inc, Cary, USA). All data and statistical analysis were performed at Novo Nordisk Asia Pacific Center. Descriptive statistics were used to describe the findings.

**Results**

One thousand and seventy-eight patients were recruited from 37 sites, including 300 males and 778 females. Their mean ± SD (range) of age, onset age and diabetes duration were 58.2 ± 11.3 (13-86), 52.2 ± 11.4 (8-83) and 6.2 ± 4.0 (2-42) years, respectively. Six percent of the patients were type 1, and 94% were type 2 diabetics. The mean ± SD of body mass index (BMI) was 24.4 ± 4.1 kg/m\(^2\). Overweight, BMI 23.0-24.9 kg/m\(^2\) and obesity, BMI >25.0 kg/m\(^2\) were noted in 24.3% and 39.2% of the patients, respectively. Current cigarette smoking was observed in 12.1%; meanwhile, regular alcohol drinking was noted in 5.8% of the patients.

Two-thirds of the patients engaged in diabetes education ≥ 5 days in the previous year. It was noted that 28.9% of the patients followed diet instruction, and 17.2% did exercise on a regular basis. None of the patients performed self-blood glucose monitoring. Urine testing for glucose at home was observed in 0.2% of the patients. Monitoring of glycemic control was largely done by measurement of fasting plasma glucose (FPG) at the clinics where the patients attended. The mean ± SD times of FPG measurement per year was 9.8 ± 2.1, with a range of 2-22 measurements per year. Determination of HbA\(_1c\), total cholesterol, triglyceride, HDL-cholesterol, serum creatinine, urinary protein, and microalbuminuria were observed in 0.7, 17.4%, 11.7%, 6.9%, 38.2%, 33.0%, and 0.9% of the patients, respectively. Fundoscopic and foot examinations were performed in 21.5% and 45.0% of the patients, respectively (Fig. 1).

The mean ± SD of fasting plasma glucose was 8.3 ± 2.7 mmol/l and HbA\(_1c\) measured by the central laboratory was 8.6 ± 1.9%. The percentage of patients with optimal glycemic control FPG < 6.7 mmol/l and HbA\(_1c\) < 7% were 28.7% and 19.6%, respectively. Uncontrolled diabetes, FPG > 7.8 mmol/l and HbA\(_1c\) > 8% were noted in 53.5% and 58.1% of the patients, respectively (Fig. 2). Hypertension, blood pressure ≥ 140/90 mmHg or use of antihypertensive drug(s) was found in 37.3% of the patients. The frequently prescribed antihypertensive drugs were diuretic and angiotensin converting enzyme inhibitor in 55.7 and 38.0% of the prescribed treatment, respectively (Fig. 3). Serum total...
Fig. 1  The proportion of patients managed under primary care units who were provided with the recommended annual assessments for diabetes over the previous 12 months

![Graph showing the proportion of patients provided with recommended annual assessments for diabetes.]

Optimal control
Acceptable control
Poor control

Fig. 2  The level of glycemic control among patients managed under primary care units, as assessed by two different criteria: the American Diabetes Association (ADA) 2001 criteria and the Asia Pacific type 2 Diabetes Policy Group (AP) criteria

In the ADA 2001 criteria, optimal control is defined as FPG < 6.7 mmol/l, HbA1c < 7.0%, acceptable control: FPG 6.7-7.8 mmol/l, HbA1c 7.0-8.0%, poor control: FPG > 7.8 mmol/l, HbA1c > 8.0%

In the Asia Pacific type 2 Diabetes Policy Group (AP) criteria, optimal control is defined as: FPG ≤ 6.1 mmol/l, HbA1c ≤ 6.5%, acceptable control: FPG 6.11-7.0 mmol/l, HbA1c 6.51-7.5%, poor control: FPG > 7.0 mmol/l, HbA1c > 7.5%
The frequency of anti-hypertensive agent usage among patients managed under primary care units is illustrated in Fig. 3. The modalities and percentages are as follows: diuretics (55.7%), CCB (38%), ARB (12.1%), β-blocker (16.1%), α-blocker (2.8%), ACE-I (18.1%), and others (5.3%).

The prevalence of diabetic complications observed among patients under primary care units is shown in Fig. 4. The most common complications were retinopathy (13.6%), renal failure (34%), acute foot ulcer/gangrene (6.9%), myocardial infarction (0.7%), stroke (0.1%), proteinuria (17%), and peripheral neuropathy (0.1%).

Cholesterol > 6.0 mmol/l and triglycerides > 2.2 mmol/l were found in 33.3% and 38.4% of the patients, respectively. Meanwhile, 27.0% of the patients had high-density lipoprotein cholesterol (HDL-C) < 1.0 mmol/l. Only 5.3% of the patients received lipid-lowering agents. Fibrate was prescribed in (86.8%), followed by statin (5.7%).

The majority of patients were taking oral hypoglycemic agent(s), while 6.7% needed insulin therapy. Treatment with traditional/herbal medicine was seen in 2.4% of the patients, whereas, 3.1% of the patients were on non-pharmacologic treatment. There were three types of oral hypoglycemic agents prescribed, including sulphonylurea (87.6%), metformin (53.2%), and alpha-glucosidase inhibitor (1.3%). Approximately, one half of the patients were on combination therapy.

The prevalence of late complications illustrated in Fig. 4 was retinopathy (13.6%), proteinuria (17%), nephropathy (0.1%), neuropathy (0.1%), and amputation (0.1%).
(17.0%), end stage renal failure (0.1%), peripheral neuropathy (34%), acute foot ulcer/gangrene (1.2%), healed foot ulcer (6.9%), stroke (1.9%) and myocardial infarction (0.7%). Cataract was frequently observed in 22.4% of the patients. A significant increase in serum creatinine of > 2.0 mg/dl was noted in 29 (7.2%) out of 405 patients assessed. Legal blindness (visual acuity < 20/200) was observed in 0.6% of the patients.

Discussion

The present study described the status of diabetes care and the outcomes among diabetic patients managed in primary health care facilities in Thailand during the year 2001. The proportion of patients with type 2 DM was similar to that previously reported(4,5). The same demographic data as in previous reports were predominant of female patients, mean age, mean BMI, and percentage of overweight patients. However, the patients in the present report compared with the cohort of patients cared for in secondary/tertiary centers in 1998(5) had a later age of onset (52.2 ± 11.4 vs 49.6 ± 11.7 years), a shorter duration of diabetes (6.2 ± 4.0 vs 9.9 ± 6.7 years), and a higher rate of cigarette smoking (12.2 vs 5.0%). The comparison to the study in 1998 was chosen because it was the closest time, and the same definitions as well as standard measurement of HbA1c were applied.

The monitoring of glycemic control was mainly based on measurement of FPG. The HbA1c was barely assessed because the test was not available in primary health care units. The determination of serum lipids, a well-known cardiovascular risk, was infrequent. The annual assessment for diabetic complications was far less than those in secondary/tertiary care centers in Thailand(5). The most frequent assessment was serum creatinine in 38.2% of the patients. The reasons for sub-optimal assessment were not explored by this survey. Realizing the healthcare providing system in Thailand, one reason could probably be the limited staff manpower and facilities in the primary care units. Other possible reasons included no recognition or unawareness of recommendations, negligence of physicians and ignorance of the patients. Unsurprisingly, the inadequate assessments were still observed in other parts of the world(8,11).

The outcome of glycemic control was not satisfactory. The mean ± SD of FPG and HbA1c were 8.3 ± 2.7 mmol/l and 8.6 ± 1.9%, respectively. Only 19.6% of the patients had HbA1c < 7.0%. A limited choice of anti-hyperglycemic agents in a primary care setting might be one cause of sub-optimal glycemic control. However, glycemic control of the patients in the present report was comparable to those treated elsewhere with somewhat similar facilities of care(9-13). Unexpectedly, the outcome of glycemic control did not differ from those patients treated in the secondary/tertiary care centers in Thailand(5). In patients with longer diabetes duration as those treated in secondary/tertiary care centers, a progressive loss of β-cell mass worsen glycemic control could result in more difficult to treat to target(14). This might explain the similar outcome of sub-optimal glycemic control of the patients treated in the secondary/tertiary care centers(5).

Even though the glycemic control was similar to that achieved in the secondary/tertiary care centers(5), the complication rates differed quite remarkably. The prevalence of diabetic retinopathy was 13.6%, less than 24% observed in the patients treated in the secondary/tertiary care centers(5). A shorter duration of diabetes in this group of patients might explain the difference. The prevalence of stroke (1.9%) and myocardial infarction (0.7%) were less than 3% previously observed in the secondary/tertiary care centers as well. Although the smoking rate was higher, the lower rate of hypertension and dyslipidemia in this cohort could contribute to this finding. Hypertension and dyslipidemia were established vascular risk factors(15,16). Peripheral neuropathy noted in 34% of the patients was higher than 27% seen in a previous report(5). The reason was not clear but the finding itself could explain the higher rate of the acute foot ulcer/gangrene in 1.2% and healed foot ulcer in 6.9% of this cohort. Interestingly, the prevalence of proteinuria and elevated serum creatinine were similar compared to a previous report(5) (17% vs 17% for proteinuria and 7% vs 6% for elevated serum creatinine). Renal disease was common in the Thai population(17). Albeit, other diseases causing renal impairment in type 2 diabetes were not uncommon(18,19). The causes of proteinuria and elevated serum creatinine were not defined in the present study.

Conclusion

The present study demonstrated that the necessary, routine measures, such as an annual health check-up for patients with diabetes, were not regularly practiced by caregivers in primary care units. Peripheral neuropathy was the most common complication, and this might explain the observed high rate of foot ulcers. Sub-optimal glycemic control and cardiovascular risk management in the majority of patients could probably contribute to a higher complication rate in long-term follow-up.
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Appendix

List of participating hospitals.

Northern region (Chiangmai and Lampang Province): Fang Hospital, Chomthong Hospital, Sanpatong Hospital, Sansai Hospital, Mae-on Hospital, Koa-ka Hospital, Turn Hospital, Hangchat Hospital, Ngaoo Hospital, Jachom Hospital.

Central region (Ratchburi and Petchburi Province): Vatpleng Hospital, Jed-samien Hospital, Bangpare Hospital, Jombung Hospital, Banlard Hospital, Banhlam Hospital, Kangkrachan Hospital, Kao-yoi Hospital.

Northeastern region (Nakhon Ratchasima and Chaiyaphum Province): Chokchai Hospital, Jagnkarach Hospital, Pukthongchai Hospital, Dankhuntod Hospital, Non-sung Hospital, Kangkraw Hospital, Banthar Hospital.

Southern region (Songkhla and Pathalung Province): Thepa Hospital, Bangklam Hospital, Ranod Hospital, Natavi Hospital, Sadao Hospital, Kuanakuan Hospital, Papayom Hospital, Papayom Hospital, Kaoochaisong Hospital, Ta-mod Hospital.

References

การสำรวจการดูแลรักษาเบาหวานและการเกิดภาวะแทรกซ้อนของผู้ป่วยเบาหวานในหน่วยบริการปฐมภูมิ

ภานันท์ วรรณี, เชฏฐากุล ธัญญา, แสงอากาศ เพ็ญศิริวรรณ, ธีระเกียรติกำจร เขมรัสมี จิณ ปิง เยียว

การศึกษาภาคตัดขวางนี้มีจุดประสงค์ที่จะสำรวจการดูแลรักษาเบาหวาน และการเกิดภาวะแทรกซ้อนในผู้ป่วยเบาหวานกลุ่ม 37 แห่งในเขตเทศบาล หน่วยบริการแต่ละแห่งสุ่มเลือกผู้ป่วยที่มารักษาในเวลานี้อย่างน้อย 1 ปีไม่เกิน 30 คน และเป็นมีการร่วมกันทั่วประเทศในประเทศ 1 ปี เพื่อเก็บข้อมูลการดูแลรักษา ผลการรักษา และภาวะแทรกซ้อนเรื่องต่างๆ ที่เกี่ยวข้องที่ได้ในแบบบันทึกที่เกี่ยวข้องถูกส่งเข้าเป็นฐานข้อมูลโดยเครื่องคอมพิวเตอร์ และใช้เครื่องคอมพิวเตอร์ SAS รุ่น 6.12 โดยผู้จัดานนับ 1,078 คน เป็นชาย 300 คน และหญิง 778 คน มีอายุเฉลี่ย (± ค่าเบี่ยงเบนมาตรฐาน) 58.2 (± 11.3) ปี อาชีพที่เกิดเบาหวานเฉลี่ย 52.2 (± 11.4) ปี ระยะเวลาที่เป็นเบาหวานคิดเป็น 11.4 ปี ผู้ป่วยในกลุ่ม (ระยะเวลา 1 ปี) ที่เป็นเบาหวานมีน้ำตาลในเลือดเฉลี่ย 8.6 (± 1.9) มิลลิโมล/ลิตร ผู้ป่วยที่พบมีภาวะแทรกซ้อนเรื่องต่างๆ ภาวะแทรกซ้อนที่พบคือ จอประสาทตาเสื่อมจากเบาหวานในอัตรา 13.6, มีโปรตีนในปัสสาวะในอัตรา 17.0, ไตวายในอัตรา 0.1, มีโรคหลอดเลือดสมองในอัตรา 34.0, มีผลการเจ็บป่วยที่เท้าในอัตรา 12.1 ผู้ป่วยที่มีภาวะแทรกซ้อนเรื่องต่างๆ ทำให้การประเมินการดูแลรักษาเบาหวานในหน่วยบริการปฐมภูมิทำได้ไม่ครบถ้วน การมีการระบุภาวะแทรกซ้อนในอัตราสูงอาจทำให้อาจการบันทึกผลที่แท้ในผู้ป่วยกลุ่มนี้ได้