Association between Oral Hypoglycemic Agents, Insulin and Lifestyle Modifications on Glycemic Control among Type 2 Diabetes Patients in Thailand: National Survey in 2011

Soe Sandi Tint MB, BS*, Wilaiphorn Thinkamrop Dr. P.H **,
Sumitr Sutra MD, Dip Thai Bd Ped, Dip Gastroenterology***,
Nintita Sripaiboonkij MPH (Biostatistics) ****,
Bandit Thinkhamrop PhD**

** Faculty of Medicine, Clinical Epidemiology Unit, Chulalongkorn University, Bangkok, Thailand*
*** Faculty of Public Health, Khon Kaen University, Khon Kaen, Thailand*
**** Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand*
***** Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand*

Background: *Oral hypoglycemic agents (OHA), insulin, and lifestyle modifications are commonly prescribed to Type 2 diabetes (T2DM) patients to control their blood glucose level and prevent severe complications. However, the effects in clinical care at national level had never been evaluated.*
Objective: *To quantify effects of oral hypoglycemic agents (OHA), insulin, and lifestyle modifications on glycemic control among T2DM patients in Thailand.*
Material and Method: *The present paper was a part of the study involved in the national representative sample of 59,750 patients with T2DM and/or hypertension based on medical records, conducted at 548 hospitals in Thailand in 2011.The level of HbA1c was the target of the present study. Multiple logistic regression was used to obtain the magnitude of the effects of OHA, insulin, and lifestyle modifications on glycemic control.*
Results: *Among the 20,328 T2DM patients, only 2.2% were prescribed lifestyle modifications, 82.6% were on OHA alone, 4.2% were on insulin alone, and 11.0% were both insulin and OHA. About 35.3 % (95%CI: 34.5 to 36.0) achieved glycosylated hemoglobin (HbA1c) controlled. Patients with lifestyle modifications were 4.1 times (OR= 4.1, 95%CI: 3.0 to 5.7) the odds of achieving HbA1c controlled comparing to those taking OHA alone after adjusting the various factors.*
Conclusion: *Type 2 diabetes patients who took lifestyle modifications were more likely to reach the target HbA1c level than those who took OHA alone.*

Keywords: *Oral Hypoglycemic Agents, Insulin, Life style modification, Type2 diabetes, HbA1c*

J Med Assoc Thai 2017; 100 (5): 512-20
Full text. e-Journal: *http://www.jmatonline.com*

Diabetes Mellitus is one of the major public health problems and its prevalence is increasing globally. The world prevalence of diabetes among adults (aged 20-79 years) was about 6.4%, affecting 285 million adults in 2010 and expected to increase to 7.7% and 439 million adults by 2030[1]. Asian countries contribute to more than 60% of the world's diabetic population as the prevalence of diabetes is increasing in these countries[2]. Moreover, in people with diabetes, the cardiovascular diseases are the major cause of morbidity and mortality. It was reported that patients with diabetes had twice the risk of myocardial infarction (MI) and stroke than that of general population, also had 2-4 folds increased risk of cardiovascular events than those without diabetes[3]. Therefore the importance to reducing the prevalence of diabetes in Asian countries and controlling the glycosylated hemoglobin (HbA1c) are the high priories to decrease the burden of diabetes and delaying its complications[4,5].

Correspondence to:
Thinkamrop B, Data Management and Statistical Analysis Center (DAMASAC)Faculty of Public Health, Khon Kaen University, Khon Kaen 40002, Thailand.
Phone: +66-85-0011123
E-mail: bandit@kku.ac.th, karawa@gmail.com

Many glycemic uncontrolled diabetes patients will develope complications after 5 years of being diagnosed. A study found that in T2DM patients, each percentage point reduction of the HbA1c level was associated with 35% reduction of micro vascular complications and 7% reduction of all case mortality[6]. In Thailand, according to the findings from the Thai Diabetes Registry Project on 2006, only 26.3% of 2,342 participants had got control of HbA1c to less than 7%[7]; and also in 2009, among 140 diabetes patients, 56% of the patients were poor glycemic status[8]. According to the Guideline of American Diabetic Association for T2DM patients, lifestyle modifications including modified diet, increased physical activity, and weight loss are critical for all diabetes patients to achieve the target goal and metformin is the preferred initial pharmacological agent for T2DM (if tolerated and not contraindicated).

Previous cohort study showed that the effect of lifestyle modification on improving the glycemic control of T2DM patients was small in one year, but significant at three years after initiation of the intervention[10]. On 2005, one clinical trial was conducted to find out the impact of intensive modification and metformin therapy on cardiovascular disease (CVD) risk factors in the diabetes prevention program, and it found that, intensive lifestyle modification improved the CVD risk factors than metformin and placebo group[11]. Among the patients who were on pharmacological treatment, metformin got more controlled of HbA1c level than the other types OHA and insulin. However, there was no study comparing lifestyle modifications to pharmacological treatments groups. Therefore, it is still unclear which one get more controlled of HbA1c level. In addition, there was limited number of studies to investigate the association between pharmacological treatments on the glycemic control of T2DM patients in Thailand. No studies evaluate the association of lifestyle modifications and pharmacological treatments on glycemic control. The present study aimed to quantify effects of oral hypoglycemic agents (OHA), insulin, and lifestyle modifications on glycemic control among T2DM patients in Thailand.

Material and Method

Research Design

This was a cross-sectional analytical study utilized the data from part of the previous study "An Assessment on Quality of Care among Patients Diagnosed with T2DM and Hypertension Visiting Ministry of Public Health and Bangkok Metropolitan Administration Hospitals in Thailand (Thailand DM/HT)" conducted in 2011. All public hospitals under the Ministry of Public Health (MOPH) outside Bangkok and all hospitals and clinics participated in the Thailand National Health Security Office (NHSO)'s program within Bangkok formed the sampling frame. All T2DM patients visiting these hospitals in 2011 were eligible.

Inclusion criteria for the present study

Patients with T2DM aged 35 years old and older who received medical care in the targeted hospitals for at least 12 months were enrolled. They were excluded if they participated in any other clinical trials. Among 59,750 of the collected patients with T2DM, hypertension (HT) and both DM and HT (DM/HT), 32,890 of HT patients and 6,532 patients with any form of chronic complications were excluded. Therefore, the total of 20, 328 patients were analyzed in the present study.

Sampling methods

According to the Thailand DM/HT study, a two-stage stratified cluster sampling with probability proportional to the hospital size according to number of beds was used to select as national and provincial representative samples. The first stage sampling was the province which constituted 77 strata and the second stage was the hospitals in each province. The hospitals in each province were then stratified into 5 strata by their sizes, i.e., regional center hospital (>500 beds), provincial general hospital (200-500 beds), large community hospital (90-120 beds), medium community hospital (60 beds), and small community hospital (10-30 beds).

Data collection methods

In the Thailand DM/HT study, the required number of T2DM patients was given to clinics that provided medical care for T2DM patients. A standardized case report form was used to obtain the required information from medical records and sent to the Medical Research Network of the Consortium of Thai Medical Schools (MedResNet) central data management unit in Nonthaburi, Thailand. The data collection was done by participating hospital's authorized and well-trained personnel who had been trained to protect the privacy of personal health information from unauthorized use, and deliberately engaged in the study. The data were then abstracted from patients' medical records. These included baseline

information, status of diabetes, laboratory test results and medications. The data for each variable of laboratory test results, medication were verified by date, month, year and other variables were verified accordingly before data analysis.

Primary Outcome Measurement

Blood Glucose level (HbA1c >=7% as uncontrolled and HbA1c <7% as control) were the primary outcome of the present study. The cut point for this outcome is determined from the American Diabetes Association. Levels of HbA1c were examined by each participating hospital's laboratory. For each patient, the HbA1c levels of the last two hospital visits of the year 2011 were used.

Independent variables

The main independent variable was the treatment modality. Patients were classified as being treated either with OHA alone, insulin alone, both OHA and insulin, or lifestyle modifications. The lifestyle modifications included any of the followings: dietary control, body weight reduction, and physical exercise. The treatments were prescribed by clinicians of each hospital based on their routine clinical care. In addition, socio-demographic characteristic of the participants served as the covariates where their effects on the association between the factors of interests and the outcome were accounted for. These included gender, age, occupation, and duration of diabetes, health care financing, and body mass index (BMI) and low density lipid (LDL) cholesterol as potential confounders.

Statistical Analysis

Characteristics of participants were described using frequency and percentage for categorical data and the mean together with its standard deviation for continuous data. Multiple logistic regression was used to answer the research questions. Firstly, effects of the treatment modality and other covariates on achievement of HbA1c controlled were examined using bivariate logistic regression. The crude odds ratios (OR) and their 95% confidence intervals (95%CI) were estimated. Effects of other variables and potential confounders on the outcome were also explored. These included gender, age, BMI, duration of diabetes, occupation, and health care coverage and LDL. The initial model of multivariable analysis included the treatment modality and all other variables which were found to be bio-sociologically important and that with *p*-value of bivariate analysis were 0.25 or less. Interaction effects between the treatment modality and other significant covariates were also investigated. A hybrid approach was used as method for variable selection to obtain the final model. As the design involved stratified sampling by hospitals, the post hoc adjustment for the standards error that accounted for clustering effects of hospitals was implemented. The adjusted OR, 95% CI, and *p*-value were reported. All analyses were performed using Stata version 13.0 (Stata Corp, College Station, TX). A *p*-value of less than 0.05 was considered as statistically significant. All statistical tests were two-sided.

Results

Characteristics of the T2DM patients

From the total of 59,750 patients with DM, HT, or both, we excluded 32,890 patients with HT alone (Fig 1). Of the 26,860 DM patients with or without HT, we further excluded 6,532 patients with any form of chronic complications. Therefore, the present study involved 20,328 patients with no complications.

Table 1 showed their baseline characteristics. The mean age was 58.9 (SD = 10.7) years, with 47.6 % of patients were >60 years of age and 71.8% of patients were female. The mean duration of DM was 5.6 (SD = 4.6) years and 66.8% were daily workers. About half of the patients, 51.2%, were either overweight or obese. More than half of them, 58.5%, got health care financing from universal scheme. Most of T2DM patients from the present study, 82.6% were on OHA alone and only 2.2% were on lifestyle modifications. About one-third of patients, 35.3%, achieved the level of HbA1c<7%. There were 35.9% of patients in the present study had hypercholesterolemia.

Bivariate and Multivariable logistic regression

Among the total of 20,328 patients whose data on treatment modality were available, 5,129 patients had control of HbA1c level, 35.3% (95% CI: 34.5% to 36.0%). In bivariate analysis, patients who took lifestyle modifications were 4.7 times the odds to get glycemic control than those with only OHA (95% CI: 3.6 to 6.2) (Table 2). But patients who took insulin alone were 60% less likely to achieve glycemic control than those with OHA alone, (OR = 0.4; 95% CI: 0.3 to 0.5). The older the patients were, the less likely the patients to be able to control their glycemic level, i.e: patients aged 60 years or greater were 2.6 times the odds of getting their glycemic control comparing to those at the age of less than 40 years,

OR = 2.6 (95% CI: 2.1 to 3.2).

Taking into accounts of other factors in multivariable analysis, patients who were on lifestyle modifications were 4.1 times the odds of achieving HbA1c control compared to those who took only OHA, ORadj = 4.1 (95%CI: 3.0 to 5.7) (Table 3). On the contrary, patients who took only insulin, 50% of them were more likely to achieve HbA1c control compared to those with OHA alone (ORadj = 0.5; 95%CI: 0.4 to 0.6). These were already adjusted for the effect of gender, age, occupation, health care coverage, BMI, duration of being DM, and total cholesterol.

Discussion

The present study was the first in Thailand that involved a large national representative sample of patients with T2DM and investigated the effects of OHA, insulin and lifestyle modifications on glycemic control in group of patients under real circumstances,uncontrolled conditions. The percentage of glycemic control among the study sample was 35.3% during 12 months study period and this was comparable to the reports from other countries[12-15]. More than three quarters of patients, 82.6%, were treated with OHA alone. Only 2.2% of patients were prescribed lifestyle modifications. We found that patients with lifestyle modifications were 4.1 times the odds of achieving HbA1c controlled comparing to those taking OHA alone even after adjusting the various factors.

According to clinical practice and literature background, patients who already had chronic complications or other co morbidities can control their HbA1c level only with lifestyle modifications. In the present study, only T2DM patients without complications were included, hence, few of them were prescribed lifestyle modifications. Thus, in overall, the low rate of achievement of glycemic control, 35.3%, under the situation where majority of patients, 82.6%, were prescribed OHA required special attention. The achievement rates among patients being prescribed OHA alone and with lifestyle modifications were 38.1% and 74.4%, respectively. Since the present study was a cross-sectional design, one might argue that this large difference could be due to temporal relationship, i.e: patients with uncontrolled HbA1c might be prescribed medications rather than life style modifications; hence, controlling HbA1c was not the effect but the cause. However, in clinical practice, the HbA1c measurement was usually done for assessing the patients' achievement of glycemic control after some interventions, and not being used as the basis for prescribing the treatment. Rather, the fasting or random blood glucose level was done for prescription. That is, if the fasting glucose level of less than 7.0 mmol/L and a 2-h level post oral glucose challenge of 7.8-11.1 mmol/L, it was advisable to start with lifestyle modifications and if fasting glucose level of greater than 7 mmol/L, prescription of OHA was recommended. Then after 2-3 months of the treatments, patients will be followed up by their HbA1c level, so their achievement of glycemic control can be assessed. In addition, the present study was based on the large national representative sample; such finding was unlikely to be bias toward a particular clinical practice. Therefore, we considered our study provided an evidence of stronger effect of lifestyle modifications on glycemic control than the OHA alone.

The present study conform to the findings from previous studies. The study demonstrated that the effect of lifestyle modifications on glycemic control was significantly improved 3 years after initiation of the intervention[10] . Another study showed that herbal treatment can also achieve the HbA1c control level[16] . However, these studies including the present one were observational studies. In light of these evidences, a randomized control trial comparing the effectiveness of lifestyle modifications and OHA on achievement of glycemic control among T2DM patients is warranted. In the present study, patients treated with insulin alone and who took combination therapy were more likely to have poorer glycemic control than those with only insulin. These findings were consistent with an

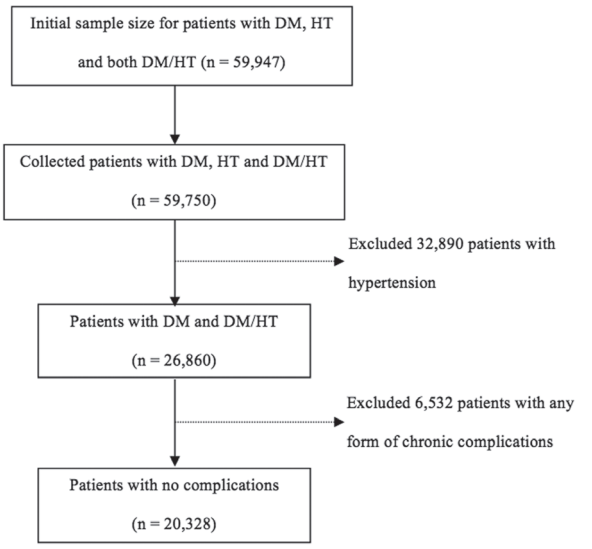

Fig. 1 Survey Flow Chart.

Table 1. Characteristics in Type2DM patients presented with frequency and percentage unless specified otherwise

Characteristics of patients	Number (n=20,328)	Percent
Gender		
Male	5,732	28.2
Female	14,596	71.8
Age (years)		
<40	751	3.7
40-49	3,114	15.3
50-59	6,792	33.4
≥60	9,668	47.6
Mean 58.9±10.7		
Median 60.0, Range 60.0-98.0		
Body mass index (kg/m2)		
<18.5 (underweight)	614	3.2
18.5 - 24.99 (normal)	8,664	45.6
25 - 29.99 (overweight)	7,045	37.0
≥30 (obesity)	2,700	14.2
Mean 25.6±4.4		
Median 25.1, Range 11.1-49.6		
Duration of diabetes (years)		
<5	8,234	42.6
5-10	7,713	40.0
>10	3,363	17.4
Mean 5.6±4.6		
Median 6, Range 0.0-54.0		
Health Care Financing		
Universal scheme	11,884	58.5
Government or state enterprise officer	3,428	16.8
Self- funding	729	3.6
Community	4,292	21.1
Occupation		
Not daily worker	3,843	20.3
Daily worker	12,665	66.8
Own Business	2,436	12.9
Types of treatment		
Only OHA	16,387	82.6
Only Insulin	844	4.2
Both OHA and Insulin	2,180	11.0
Lifestyle modifications (diet, reducing weight, and exercise)	436	2.2
Total cholesterol (mg/dl)		
<200	10,490	64.1
≥200	5,870	35.9

earlier study[4]. This may be because the patients with combination therapy usually had long standing diabetes, as their mean duration was 7 to 8 years which were associated with a progressive declined in beta cell function, adding medication may not show favorable results. According to the literature, insulin mono-therapy was comparable to combination therapy in achievement of the target value of HbA1c. The combination therapy is superior to insulin mono-therapy only in case of using daily dose of insulin, and has significantly decreased the total dose of daily insulin[17].

The current study also found that male patients had a higher proportion of achievement of glycemic control than female in Thailand. This was consistent with findings from Saudi Arabia, the authors explained that female had limited ability to take up exercise or employment outside their homes in Arabian community[18]. However, these findings contradicted to what was found in the United States which found that male had poorer glycemic control than female[4]. Thus, roles of gender on achievement of glycemic control remain unclear.

The present study showed that the longer the

Table 2. Association between each factor on glycemic control among type 2 diabetes patients based on using simple logistic regression analysis

Factors	Number	% of controlled HbA1c	Crude OR	95% CI	*p*-value
Type of treatments					<0.001
Only OHA	4,561	38.1	1		
Only Insulin	106	19.2	0.4	0.3, 0.5	
Both OHA and Insulin	236	13.9	0.3	0.2, 0.3	
Lifestyle modifications (diet, reducing weight, and exercise)	221	74.4	4.7	3.6, 6.2	
Gender					0.001
Male	1,596	39.3	1		
Female	3,533	33.7	0.8	0.7, 0.9	
Age (years)					<0.001
<40	115	21.4	1		
40-49	587	26.6	1.3	1.1, 1.7	
50-59	1,568	32.3	1.8	1.4, 2.2	
≥60	2,859	41.3	2.6	2.1, 3.2	
Body mass index (kg/m2)					0.001
<18.5 (underweight)	2,371	37.4	1		
18.5-24.99 (normal)	169	40.0	1.0	0.8, 1.2	
25-29.99 (overweight)	1,684	33.1	0.8	0.8, 0.9	
≥30 (obesity)	646	33.0	0.9	0.8, 1.0	
Duration of diabetes (years)					<0.001
<5	2,396	40.2	1		
5-10	1,871	33.2	0.7	0.7, 0.8	
>10	715	29.0	0.6	0.5, 0.7	
Occupation					0.007
Not daily worker	1,162	41.3	1		
Daily worker	2,929	32.7	0.8	0.7, 0.9	
Own Business	642	35.1	0.9	0.7, 1.0	
Health Care Financing					<0.001
Universal scheme	2,710	32.0	1		
Government or state enterprise officer	1,076	41.4	1.5	1.4, 1.6	
Self-funding	175	32.0	1.1	0.9, 1.2	
Community	1,168	39.9	1.4	1.3, 1.5	
Total cholesterol (mg/dl)					<0.001
<200	3,124	37.3	1		
≥200	1,362	30.7	0.8	0.7, 0.8	

95%CI = 95% confidence interval
Crude OR= Crude odds ratio

duration of being diabetes, the more difficuly the patients to achieve glycemic control. Again, this finding remain controversy, on study confirmed it[15] while another did not[4]. The poor glycemic control over time could be explained by reduction in beta cell function and increased fat mass, led to greater insulin resistance. Achieving the level of HbA1c of less than 7% is difficult in patients with longer duration of T2DM.

Regarding the roles of age on glycemic control, the present study found that patients aged 60 years or older had higher proportion of HbA1c controlled than that of the younger patients. This finding conformed with those found in other countries[4,15]. This was because the targeted level of HbA1c depends on individuals and it varies with disease duration, such as the presence of co morbidities, the severity of diabetes complications, social and educational issues, age, etc. For instance, older patients had a looser targets of HbA1c level, i.e: between 7.5-8.0%. But in the present study, the targets HbA1c level was 7% for all patients regardless of other factors listed previously.

In conclusion, T2DM patients who took lifestyle modifications were more likely to reach the

Table 3. Association between type of treatments on glycemic control among type 2 diabetes patients based on using multiple logistic regression analysis

Factors	Number	% of controlled HbA1c	Adjusted OR	95% CI	*p*-value
Type of treatments					<0.001
Only OHA	4,561	38.1	1		
Only Insulin	106	19.2	0.5	0.4, 0.6	
Both OHA and Insulin	236	13.9	0.3	0.2, 0.4	
Lifestyle modifications (diet, reducing weight, and exercise)	221	74.4	4.1	3.0, 5.7	

Adjusted OR = Adjusted odds ratio which adjusted for the effect of gender, age, occupation, health care financing, BMI, duration of being under DM, and total cholesterol

target HbA1c level than those who took OHA alone. Health care providers should always encourage the patients to take intensive lifestyle modifications. Further randomized control trail investigating the effectiveness of lifestyle modifications and OHA on glycemic control for T2DM patients is warranted.

Ethical Consideration

The Thailand DM/HT study was approved by the Ethical Review Committee for Research in Human Subjects, Thailand Ministry of Public Health, and the Royal Thai Army Medical Department Ethical Review Board as well as local Institutional Review Boards of local participated hospitals.

The current study was approved to utilize the data of the Thailand DM/HT study by the committee of the Data Archival for Maximizing Utilization of Data (DAMUS) which can be accessed at http://www.damus.in.th.

What is already known on this topic?

- Effect of lifestyle modifications on improving glycemic control of patients with T2DM was significantly occurred three years after initiation of the intervention.
- Metformin got more controlled of HbA1c level than the other types OHA and insulin, among the patients who were on pharmacological treatment.
- More than three quarters of T2DM patients were treated with OHA alone.

What this study adds?

- Comparing the effects of lifestyle modifications and different pharmacological treatments on glycemic control of T2DM patients under real circumstances uncontrolled conditions based on nationally representative sample.
- T2DM patients who took lifestyle modifications were 4.1 times more likely to reach the target HbA1c level than those who took OHA alone.
- The longer the duration of diabetes, the more difficult to get target HbA1c level <7% even on diabetes medication.
- Intensive lifestyle modifications should be given as primary treatment for T2DM.

Acknowledgement

The present research utilized data provided by the study "An Assessment on Quality of Care among Patients Diagnosed with Type 2 Diabetes and Hypertension Visiting Ministry of Public Health and Bangkok Metropolitan Administration Hospitals in Thailand (Thailand DM/HT)", a collaborative clinical study supported by the Thailand National Health Security Office (NHSO) and the Thailand Medical Research Network (MedResNet). The data were archived at the web site http://www.damus.in.th maintained by MedResNet. The present manuscript was not prepared in collaboration with the investigators of the Thailand DM/HT study and did not necessarily reflect the opinions or views of the Thailand DM/HT study, the Thailand NHSO or the Thailand MedRes Net.

Potential conflict of interest

None.

References

1. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. Diabetes Res Clin Pract 2010; 87: 4-14.
2. Ramachandran A, Snehalatha C, Shetty AS, Nanditha A. Trends in prevalence of diabetes in Asian countries. World J Diabetes 2012; 3: 110-7.
3. Al Maskari F, El Sadig M, Norman JN. The prevalence of macrovascular complications among diabetic patients in the United Arab Emirates. Cardiovasc Diabetol 2007; 6: 24.
4. Benoit SR, Fleming R, Philis-Tsimikas A, Ji M. Predictors of glycemic control among patients with Type 2 diabetes: a longitudinal study. BMC Public Health 2005; 5: 36.
5. Sidorov J, Gabbay R, Harris R, Shull RD, Girolami S, Tomcavage J, et al. Disease management for diabetes mellitus: impact on hemoglobin A1c. Am J Manag Care 2000; 6: 1217-26.
6. UK Prospective Diabetes Study (UKPDS) Group. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). Lancet 1998; 352: 837-53.
7. Kosachunhanun N, Benjasuratwong Y, Mongkolsomlit S, Rawdaree P, Plengvidhya N, Leelawatana R, et al. Thailand diabetes registry project: glycemic control in Thai type 2 diabetes and its relation to hypoglycemic agent usage. J Med Assoc Thai 2006; 89 (Suppl 1): S66-71.
8. Thaneerat T, Tangwongchai S, Worakul P. Prevalence of depression, hemoglobin A1C level, and associated factors in outpatients with type-2 diabetes. Asian Biomed 2010; 3: 383-90.
9. American Diabetes Association. Standards of medical care in diabetes--2013. Diabetes Care 2013; 36 (Suppl 1): S11-66.
10. Sone H, Katagiri A, Ishibashi S, Abe R, Saito Y, Murase T, et al. Effects of lifestyle modifications on patients with type 2 diabetes: the Japan Diabetes Complications Study (JDCS) study design, baseline analysis and three year-interim report. Horm Metab Res 2002; 34: 509-15.
11. Ratner R, Goldberg R, Haffner S, Marcovina S, Orchard T, Fowler S, et al. Impact of intensive lifestyle and metformin therapy on cardiovascular disease risk factors in the diabetes prevention program. Diabetes Care 2005; 28: 888-94.
12. Eid M, Mafauzy M, Faridah A. Glycaemic control of type 2 diabetic patients on follow up at hospital universiti sains malaysia. Malays J Med Sci 2003; 10: 40-9.
13. Turner RC, Cull CA, Frighi V, Holman RR. Glycemic control with diet, sulfonylurea, metformin, or insulin in patients with type 2 diabetes mellitus: progressive requirement for multiple therapies (UKPDS 49). UK Prospective Diabetes Study (UKPDS) Group. JAMA 1999; 281: 2005-12.
14. Wynn NS, Howteerakul N, Suwannapong N, Rajatanun T. Self-efficacy, self-care behaviors and glycemic control among type-2 diabetes patients attending two private clinics in Yangon, Myanmar. Southeast Asian J Trop Med Public Health 2010; 41: 943-51.
15. Adham M, Froelicher ES, Batieha A, Ajlouni K. Glycaemic control and its associated factors in type 2 diabetic patients in Amman, Jordan. East Mediterr Health J 2010;16: 732-9.
16. Jayawardena MH, de Alwis NM, Hettigoda V, Fernando DJ. A double blind randomised placebo controlled cross over study of a herbal preparation containing Salacia reticulata in the treatment of type 2 diabetes. J Ethnopharmacol 2005; 97: 215-8.
17. Van Avendonk MJ, Gorter K, Goudswaard AN, Rutten GE, Van den Donk M. Combinations of insulin and oral hypoglycaemic agents for people with type 2 diabetes mellitus on insulin treatment. Cochrane Database of Systematic Reviews [Internet].1996 [cited 2013 Jul 4]. Available from: http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD006992/pdf
18. Akbar DH. Low rates of diabetic patients reaching good control targets. East Mediterr Health J 2001; 7: 671-8.

ความสัมพันธ์ระหว่างการรักษาโรคเบาหวานด้วยยารับประทาน ยาฉีดอินซูลิน หรือการปรับเปลี่ยนพฤติกรรมสุขภาพ และผลควบคุมระดับน้ำตาลในเลือด ของผู้ป่วยเบาหวานชนิดที่สองในประเทศไทย : การสำรวจระดับชาติในปี พ.ศ. 2554

ซือ แซนดิ , วิลัยพร ถิ่นคำรพ , สุมิตร สุตรา, นิลทิตา ศรีไพบูลย์กิจ, บัณฑิต ถิ่นคำรพ

ภูมิหลัง: *ผู้ป่วยเบาหวานชนิดที่สอง มักได้รับการรักษาด้วยยารับประทานรักษาโรคเบาหวาน ยาฉีดอินซูลิน หรือการปรับเปลี่ยนพฤติกรรมสุขภาพ เพื่อควบคุมระดับน้ำตาลในเลือด เพื่อป้องกันการเกิดภาวะแทรกซ้อน อย่างไรก็ตาม ผลของการรักษาดังกล่าวในโลกความเป็นจริงของเวชปฏิบัติ ยังไม่ได้รับการประเมิน*

วัตถุประสงค์: *เพื่อหาขนาดของผลการรักษาเบาหวานด้วยยารับประทานรักษาโรคเบาหวาน ยาฉีดอินซูลิน หรือการปรับเปลี่ยนพฤติกรรมสุขภาพ เพื่อควบคุมระดับน้ำตาลในเลือด ในกลุ่มผู้ป่วยเบาหวานชนิดที่สองในประเทศไทย*

วัสดุและวิธีการ: *การศึกษานี้ เป็นส่วนหนึ่งของการศึกษาที่มีการสุ่มตัวอย่างให้เป็นตัวแทนระดับประเทศ เป็นผู้ป่วยเบาหวานชนิดที่สอง ทั้งที่มีหรือไม่มีความดันโลหิตสูงร่วมด้วย จำนวน 59,750 ราย จาก 548 โรงพยาบาล โดยใช้ข้อมูลที่มีบันทึกในเวชระเบียนในปี พ.ศ. 2554 ตัวแปรวัดผลหลักคือระดับน้ำตาลในเลือด (HbA1c) สถิติที่ใช้คือการถดถอยลอจิสติกเชิงพหุ*

ผลการศึกษา: *จากผู้ป่วยเบาหวานชนิดที่สอง ที่อยู่ระหว่างการรักษา จำนวนทั้งสิ้น 20,328 ราย มีเพียงร้อยละ 2.2 ที่ได้รับคำแนะนำให้ปรับเปลี่ยนพฤติกรรมสุขภาพเพื่อควบคุมระดับน้ำตาลในเลือด มีร้อยละ 82.6 ที่ได้รับยารับประทานรักษาโรคเบาหวานอย่างเดียว มีร้อยละ 4.2 ที่ได้รับยาฉีดอินซูลินอย่างเดียว มีร้อยละ 11.0 ที่ได้รับยารับประทานรักษาโรคเบาหวานอย่างเดียว และมีร้อยละ 4.2 ที่ได้รับทั้งยารับประทานรักษาโรคเบาหวานและยาฉีดอินซูลิน พบว่า ร้อยละ 35.3 (95% CI: 34.5 ถึง 36.0) สามารถควบคุมระดับน้ำตาลในเลือดได้ และพบว่าผู้ป่วยที่ได้รับคำแนะนำให้ปรับเปลี่ยนพฤติกรรมสุขภาพสามารถควบคุมระดับน้ำตาลในเลือดได้เป็น 4.1 เท่า (OR = 4.1, 95%CI: 3.0 ถึง 5.7) ของผู้ป่วยที่ได้รับยารับประทานรักษาโรคเบาหวานเพียงอย่างเดียว ทั้งนี้ได้ควบคุมผลกระทบของปัจจัยอื่น ๆ แล้ว*

สรุป: *ผู้ป่วยที่ได้รับคำแนะนำให้ปรับเปลี่ยนพฤติกรรมสุขภาพ สามารถควบคุมระดับน้ำตาลในเลือดได้มากกว่าผู้ป่วยที่ได้รับยารับประทานรักษาโรคเบาหวานเพียงอย่างเดียว*