Original Article

Is HbA1C Level of Diabetes Patients Treated in Diabetes Clinic better than Patients Treated in General Clinic?

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Objective: The present research aims to study glycemic control in diabetes patients receiving treatment and follow ups at diabetes clinics and diabetes and hypertension clinics compared to those at general clinics.

Materials and Methods: The method is a cross-sectional study and the data was collected from the research study 'An Assessment on Quality of Care among Patients Diagnosed with Type 2 Diabetes and Hypertension Visiting Hospitals in care of Ministry of Public Health and Hospital in Bangkok, Thailand, 2013' at least 12 month of 25783 patients. Multivariate analysis was applied.

Results: From a total of 25783 patients, 11912 patients received their treatment at a diabetes clinic, 8058 patients received their treatment at a diabetes and hypertension clinic, and 5813 patient received their treatment at a general clinic. Diabetes clinics have 1.406 times poorer HbA1C control than general and other clinics (OR = 1.406, 95% CI = 1.023 -1.933). Community district hospitals are the worst at HbA1C, at 1.851 times poorer than hospitals in the Bangkok area (OR = 1.851, 95% CI = 1.525 -2.248).

Conclusion: Diabetes patients treated at diabetes clinics and diabetes and hypertension clinics have a poorer HbA1C level than diabetes patients treated at general clinics.

Keywords: Diabetes mellitus type 2, Diabetes clinic, General clinic, NCDs, HbA1C

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The incidence of Diabetes mellitus is now increasing. According to a report by the International Diabetes Federation (IDF) in 2014 there were 415 million people with diabetes. This number will rise to 642 million by 2040[1]. There are a lot of evidence-based studies which show that, the higher the level of HbA1C, the more diabetes complications. In Thailand, there is a project being done to improve the quality of life and standardize the treatment of patients diagnosed with non- communicable diseases (NCDs). These include HbA1C control in the diabetes. Thus, a Diabetes clinics were started nationwide in 2013[2].

In 1997,a retrospective review showed better risk management in diabetes complication in Diabetes clinics[3]. In 2001, a cross-sectional study in the United State showed better outcomes in diabetes patients treated in a Diabetes clinic compared to those treated in a general medicine clinic. Among general clinics, patients treated by the residents had better outcomes than patients treated by the faculty doctors[4].

In 2007, a cohort study in Canada showed less diabetes complications of patients treated by specialists compared to general practitioners[5].

A thesis in treatment outcomes of Diabetes Mellitus patients at Diabetes Clinic and Intensive Diabetes Clinic done in Thailand at Mahasarakham Hospital between 2011-2012 also showed better outcomes for patients receiving treatment at an intensive diabetes clinic[6].

General clinics are provided in every hospitals and mostly run by general practitioners to treat common diseases such as common cold, dizziness. According to the NCDs project in Thailand, most hospitals provide diabetes clinics to specifically care diabetes patients, but some diabetes patients still treated in general clinics. The report 'An Assessment on Quality of Care among Patients Diagnosed with Type 2 Diabetes and Hypertension Visiting Hospitals in care of Ministry of Public Health and Hospital in Bangkok, Thailand, 2013', about one third of diabetes patients are being treated in general clinics[7]. Thus, if this research shows better outcomes of HbA1C at diabetes clinics than general clinics, it would suggest that patients should

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be encouraged to move from the general clinics to diabetes clinics. Currently, there is not much research comparing the outcomes of patients treated in diabetes clinics and the general clinics. This research add to the growing body of literature.

Materials and Methods

Study design: The research is a cross-sectional study. The data had been collected from May 2013 to August 2013.The research location included hospitals in the network of National Health security office of Thailand. These comprised of hospitals in Bangkok area, regional medical centers, general provincial hospitals and community district hospitals.

Research Populations: The samples were taken randomly using a stratified 2-stage cluster sampling from different levels of hospitals in Thailand. In this study, there are 27,512 patients with diabetes and patients with co-diseases of diabetes and essential hypertension. The inclusion criteria are type 2 diabetes patients who had been treated at least 12 months in the network hospitals of the national health security office. Diabetes with essential hypertension using blood pressure at least more than 130/ 80 mmHg. Exclusion criteria are as follows

1. Type 1 diabetes patients, and being treated with insulin only
2. Patients treated in the ministry of public health network hospital.
3. Patients taking part in other experimental research
4. Patients who have a hospital number (HN) but have no evidence of medical records or other electronically recorded data
5. Patients do not follow up on the date of data collection and cannot be contacted to follow up regularly.

Statistical analysis

As the aim of the research is to study the glycemic control (HbA1C level) of patients in Diabetes clinics compared to those in general clinics, the data were analyzed comparing HbA1C level by mean, median, percentage, odds ratio and multivariate analysis by logistic regression. Other geographic data are shown in percentage, mean, mode and median. STATA 12/ MP version was used as the software in data analysis. Statistical significance was considered with p value < 0.05.

Result

Geographic data showed there are 17,826 female patients (68.6%) and 8,076 male patients (31.4%). The largest age group at 8,483 patients (31.7%) were between 60-69 years old. In terms of occupations, most were farmers, 10,795 patients (44.8%). Most 18,375 patients (66.5%) are co-disease with essential hypertension, while 7,527 patients (33.5%) are not. 21,208 patients (75.2%) never smoked. 1,514 (6.2%), are ex-smokers and 1,032 patients (4.0%) are current smokers.

The largest group of patients, 7,211 patients (32.2%) had a disease duration of 3-5 years. The largest group of patients, 9,004 patients (36.6%) had a BMI of 25.0-29.9 kg/m^2. Health insurance scheme category, Most 20,271 patients (87.6%) use a universal coverage scheme followed by the civil servant medical benefit scheme, 4,236 patients (9.6%), and social security scheme, 1,038 patients (2.0%).

Most patients, 14,907 patients (61.3%) were treated in community district hospitals, The largest group of patients, 11,912 patients (43.6%), were treated in diabetes clinics. The second largest group, 8,058 patients (38.0%) were treated in co-diabetes and hypertension clinics. 9,712 patients (44.4%) were from the central part of Thailand, 9,721 patients (34.5%) were from the northeastern part, 3,694 patients (11.9%) were from the northern part and 3,225 patients (9.2%) were from the southern part.

There were 18,977 patients (71.1%) treated with biguanides, 17,174 patients (67.6%) treated with sulfonylurea. There were 23,082 patients (77.6%) who followed up with fasting plasma glucose (FPG), and most 14,195 patients (62.4%) had a FPG above 130 mg%.

There were 20,481 patients (72.6%) who tested HbA1C level. Among this group there were 7,132 patients (37.3%) with an HbA1C level below 7% and 4,623 patients (20.9%) with an HbA1C level at 7.0-7.9% (Table 1).

Among the different clinics category, Diabetes clinics are the worst in HbA1C control. 27.7% of patients have an HbA1C level of more than 9.0% in Diabetes clinics, follow by 26.5% of patients in hypertension clinics, and 25.5% of patients in Diabetes and hypertension clinics. Other clinics; family medicine clinics and internal medicine (general medicine) clinics, have better glycemic control as follows (Table 2).

Table 1. Geographic data of patients

Geographic Data	Data		
	N	%	95% (C.I.)
Sex			
Male	8076	31.4%	(31.33 - 31.39)
Female	17826	68.6%	(68.61 - 68.67)
Total	25902	100.0%	
Ages (Years Old)			
20-29	0	0.0%	
30-39	472	1.7%	(1.68 -1.70)
40-49	3422	15.1%	(15.04 - 15.09)
50-59	8044	31.1%	(31.05 - 31.11)
60-69	8483	31.7%	(31.72- 31.78)
70-79	4542	17.0%	(16.95 -17.00)
80	930	3.4%	(3.44 -3.46)
Total	25893	100.0%	
Occupation			
Farmers	10795	44.8%	(44.77 - 44.83)
None	6035	27.6%	(27.59 - 27.65)
Labour	4588	16.6%	(16.60 -16.65)
Others	3408	11.0%	(10.93 - 10.98)
Total	24826	100.0%	
Co-diseases (Essential hypertension)			
No	7527	33.5%	(33.48- 33.54)
Yes	18375	66.5%	(66.46- 66.52)
Total	25902	100.0%	
Duration of diabetes (Years)			
Less than 3	3605	18.1%	(18.03 - 18.08)
3-5	7211	32.2%	(32.17 -32.23)
6-8	6465	24.7%	(24.65 - 24.71)
At least 9	7735	25.1%	(25.03 - 25.09)
Total	25016	100.0%	
Health Insurance Scheme			
Universal Coverage Scheme	20271	87.6%	(87.57 - 87.61)
Civil Servant Medical Benefit Scheme	4286	9.6%	(9.60 - 9.63)
Social Security Scheme	1038	2.0%	(2.02- 2.03)
Other	286	0.8%	(0.77 - 0.78)
Total	25881	100.0%	
Body Mass Index (BMI)			
Less than 18.50	853	3.7%	(3.72 - 3.75)
18.5-22.9	6362	26.1%	(26.12 - 26.18)
23.0-24.9	4936	20.1%	(20.11 -20.16)
25.0-29.9	9004	36.6%	(36.57 -36.64)
At least 30.0	3488	13.4%	(13.35 - 13.40)
Total	24643	100.0%	
Hospital Level			
Regional Medical Center	3782	3.1%	(3.13 -3.15)
General Provincial Hospital	5505	6.6%	(6.55 - 6.58)
Community District Hospital	14907	61.3%	(61.23 - 61.30)
Hospital in Bangkok area	1708	29.0%	(29.00 -29.06)
Total	25902	100.0%	
Clinic/OPD			
Diabetes Clinics	11912	43.6%	(43.52 -43.58)
Hypertension Clinics	67	0.2%	(0.16 - 0.17)
Diabetes and hypertension clinics	8058	38.0%	(37.93 -37.99)
Internal medicine clinics	3440	8.7%	(8.69- 8.73)
General clinics/ family medicine clinics	2089	8.9%	(8.90 - 8.94)
Other clinics	217	0.7%	(0.68 -0.69)
Total	25783	100.0%	
Region			
Northern	3694	11.9%	(11.84 -11.88)
Central	9712	44.4%	(44.33- 44.40)
Northeastern	9271	34.5%	(34.51 -34.57)
Southern	3225	9.2%	(9.21 -9.25)
Total	25902	100.0%	
Smoking status			
None/Never	21208	75.2%	(75.14- 75.19)
Current Smokers	1032	4.0%	(4.03 -4.06)
Ex-smokers	1514	6.2%	(6.20- 6.23)
No records	2148	14.6%	(14.55- 14.60)
Total	25902	100.0%	
Medications Biguanides			
No	6925	28.3%	(28.31- 28.37)
Yes	18977	71.7%	(71.63 -71.69)
Total	25902	100.0%	
Sulfonylurea			
No	8728	32.4%	(32.33 - 32.39)
Yes	17174	67.6%	(67.61- 67.67)
Total	25902	100.0%	
Non-Sulfonylurea			
No	25813	99.4%	(99.37 -99.38)
Yes	89	0.6%	(0.62 -0.63)
Total	25902	100.0%	
Thaiazolidinedione			
No	23901	96.4%	(96.37 -96.39)
Yes	2001	3.6%	(3.61 - 3.63)
Total	25902	100.0%	

Table 1. Geographic data of patients

Alpha-glucosidase inhibitor			
No	25665	99.7%	(99.69 -99.70)
Yes	237	0.3%	(0.30 - 0.31)
Total	25902	100.0%	
DPP-4 inhibitors			
No	25710	99.7%	(99.73- 99.73)
Yes	192	0.3%	(0.26- 0.27)
Total	25902	100.0%	
GLP-1 receptor agonists			
No	25893	100.0%	(99.96 -99.96)
Yes	9	0.0%	(0.03- 0.04)
Total	25902	100.0%	
Insulin			
No	20344	83.4%	(83.38- 83.42)
Yes	5558	16.6%	(16.57- 16.62)
Total	25902	100.0%	
No medicine			
No	25227	97.4%	(97.42 -97.44)
Yes (Diet control/ No medicine)	675	2.6%	(2.56- 2.58)
Total	25902	100.0%	
Fasting Plasma Glucose			
Not tested	2820	22.4%	(22.38 – 22.43)
Tested	23082	77.6%	(77.57 – 77.62)
Total	25902	100.0%	
Fasting Plasma Glucose (mg %)			
Less than 70	225	0.9%	(0.86 – 0.88)
70-130	8662	36.7%	(36.67 – 36.74)
More than 130	14195	62.4%	(62.39 – 62.46)
Total	23082	100.0%	
HbA1c Level			
Not tested	5421	27.4%	(72.55 – 72.61)
Tested	20481	72.6%	(27.39 – 27.45)
Total	25902	100.0%	
HbA1c (%)			
Less than 7.0	7132	37.3%	(7.94 – 7.95)
7.0-7.9	4623	20.9%	(37.25 – 37.33)
8.0-8.9	3227	15.8%	(20.90 – 20.96)
9.0-9.9	2181	10.0%	(15.78 – 15.83)
At least 10.0	3318	16.0%	(9.98 – 10.03)
Total	20481	100.0%	

Table 2. Clinics category and a number of patients with HbA1C level more than 9%

		HbA1c more than 9.0%	
Clinics category	Patients(N)	patients	%
Other clinics	180	33	18.3
General/ family medicine clinics	1462	285	19.5
Internal medicine clinics (general medicine)	2620	576	22.0
Diabetes and hypertension clinics	6459	1645	25.5
Hypertension clinics	49	13	26.5
Diabetes clinics	9618	2664	27.7

The relationship between clinics category and HbA1C level is then analyzed using univariate analysis. There are 5,216 patients with an HbA1C level of more than 9.0%. Of those, 4,309 patients were treated at Diabetes clinics and Diabetes and hypertension clinics. The result showed that an HbA1C level was 1.508 times (95% CI = 1.088-2.089) worse than the general clinics.(Table 3)

Multivariate analysis shows that diabetes clinics and diabetes and hypertension clinics are 1.406 times (95% CI = 1.023-1.933) worse at HbA1C than the general clinics. Community district hospitals are the worst at HbA1C control. There are 1.851 times (95% CI = 1.525-2.248) worse than hospitals in the Bangkok area, and general provincial hospitals are 1.814 times (95% CI = 1.454-2.266) worse than hospitals in the Bangkok area.

HbA1C level in patients who have been diagnosed with diabetes for at least 3 years is 1.358 times (95% CI = 1.141-1.618) worse than patients with diabetes for less than 3 years. Patients under 50 years old are 1.318 times (95% CI = 1.152-1.510) worse at HbA1C than those aged 50 or above. Females are 1.331 times (95% CI = 1.100-1.611) worse than males. The northeastern region of Thailand is worst at HbA1C control. It is 1.423 (95% CI = 1.198-1.691) times worse than the others.

Diabetes patients who do not have hypertension as a co-disease are worse at HbA1C control 1.17 times 95% CI = 1.000-1.369) than those who have diabetes with hypertension (Table 4).

Table 3. Univariate analysis of relationship between clinics category and HbA1C level

Clinic category	HbA1C≤9.0%	HbA1C >9.0%	Total	p-value	OR	95% CI	
						lower	upper
General/ family medicine clinics	1324	318	1642		1		
	80.63	19.37	8.1				
Diabetes and Diabetes and hypertension clinics	11768	4309	16077	0.014	1.508	1.088	2.089
	73.2	26.8	78.9				
Hypertension clinics	36	13	49	0.039	3.106	1.060	9.100
	73.47	26.53	0.1				
Internal medicine clinics	2044	576	2620	0.969	0.989	0.559	1.750
	78.02	21.98	12.9				
Total	15,172	5,216	20,388				
	74.42	25.58	100				

Discussion

Data from 25,783 patients were analyzed in the study, of which 11,912 patients (43.6%) were treated at diabetes clinics. 8,058 patients (38%) were treated at diabetes and hypertension clinics, and 5,746 patients (18.3%) were treated at general clinics (general medicine clinics, family medicine clinics, other clinics). Results showed that those treated at diabetes, and diabetes and hypertension clinics were 1.406 times worse at HbA1C control than those treated in general and other clinics at a statistically significant level. Other factors with significantly worse HbA1C control included the level of hospitals (general provincial hospital, community district hospital), females, age (under 50 years old), duration of diabetes (at least 3 years), northeastern region, diabetes patients without hypertension as a co-disease. Only body mass index is not statistically significance.

However, community district hospitals were reported to have a lower service quality index core than other hospitals (checking HbA1C level annually)[7]. This may cause delay in drugs dosing adjustment, patient education or even in finding causes of uncontrolled glucose level. Therefore HbA1C is gradually increasing without proper management.

The clinics schedule is also important. Most hospitals, especially community district hospitals, diabetes clinics, and diabetes and hypertension clinics, schedule check-up only once or twice a week. Therefore there are a lot of patients per day resulting in shorter time of treatment per patient.

Some patients at diabetes clinics were transferred from general or other clinics due to the difficulty in glycemic control or high severity of disease. More complicated cases may need to be treated with specialists. With these factors, patients with higher severity actually tend to have poorer HbA1C level, so diabetes clinics seem to have worse HbA1C level than others due to these group of patients. Additionally in Thailand, most specialists work at hospitals in the Bangkok areas, regional medical centers, so there is lack of specialists in community district hospitals[8]. This is reflected in poorer HbA1C control in complicated cases.

Diabetes self- management and support (DSME/ DSMS) is one of the best strategies in diabetes care[9] and is now recommended internationally. DSME/ DSMS has been published as the standard of medical care in Diabetes 2016 by American Diabetes Association (ADA)[10], yet in Thailand, some patients still lack the knowledge about diabetes. Therefore diabetes self-care is under standard leading to poor HbA1C level.

Conclusion

In conclusion, diabetes patients treated at diabetes clinics and diabetes and hypertension clinics have a poorer HbA1C level than diabetes patients treated at general clinics especially at community district hospitals. Sex, age, region, duration, and co-disease with hypertension are also associated. Due to the increasing number of diabetes, new strategies may have to be designed to improve HbA1C control. To have better HbA1C level means to have less diabetes complications, which can improve the quality of life.

Table 4. Multivariate analysis of other factors and HbA1C level

		95%CI	
HbA1C >9.0%	Odds Ratio	lower	upper
Hospital Level			
Hospital in Bangkok area	1		
Regional Medical Center	1.185	0.920	1.528
General Provincial Hospital	1.814*	1.454	2.266
Community District Hospital	1.851*	1.525	2.248
Health Insurance Scheme			
Universal Coverage Scheme	1		
Civil Servant Medical Benefit Scheme	0.660*	0.577	0.755
Social Security Scheme	1.004	0.765	1.319
Other	0.577*	0.350	0.951
Duration of diabetes (years)			
< 3	1		
≥3	1.358*	1.141	1.618
Body Mass Index (BMI)			
18.5-22.9	1		
<18.5	1.041	0.802	1.352
≥23.0	1.003	0.886	1.135
Age (Years old)			
≥50	1		
<50	1.318*	1.152	1.510
Hypertension			
Yes	1		
No	1.170*	1.000	1.369
Sex			
Male	1		
Female	1.331*	1.100	1.611
Region			
Other	1		
Northeastern	1.423*	1.198	1.691
Clinics category			
General/ family medicine/ other clinics	1		
Diabetes and Diabetes and hypertension clinics	1.406*	1.023	1.933
Hypertension clinics	2.218	0.765	6.432
Internal medicine clinics (general medicine)	1.178	0.670	2.071

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What is already known on this topic?

Diabetes mellitus is one of the non –communicable diseases causes premature death, but it is preventable. The NCDs project in Thailand aim to care patients from the beginning (primary prevention) to treat the diseases, reduce disabilities and improve quality of life (tertiary prevention). Diabetes clinic has started, believing that diabetes patients treated at diabetes clinic will get better diabetes control. Currently, Two- thirds of diabetes patients have already treated at the clinics.

What this study adds?

The study showed poorer HbA1C level of diabetes patients treated at diabetes clinics and diabetes and hypertension clinics, than those treated at general clinics. Community district hospitals make the worst at HbA1C control. Since diabetes clinics care patients from primary to the tertiary prevention, more strategies essentially need to be designed to make better control of HbA1C level in the clinics.

Potential conflicts of interest

The authors declare no conflict of interest.

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