Glycaemic Control of Diabetic Patients in an Urban Primary Health Care Setting in Sarawak: The Tanah Puteh Health Centre Experience

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Summary

Achieving glycaemic goals in diabetics has always been a problem, especially in a developing country with inadequate facilities such as in Sarawak in Malaysia. There are no reported studies on the control of diabetes mellitus in a diabetic clinic in the primary health care setting in Sarawak. This paper describes the profile of 1031 patients treated in Klinik Kesihatan Tanah Puteh Health Centre. The mean age was 59 years, the mean BMI 27kg/m². There was a female preponderance and mainly type-2 diabetes. Mean HbA1c was 7.4%. Glycaemic control was optimal in 28% (HbA1c <6.5%), fair in 34% (HbA1c 6.5-7.5%) and poor in 38% (HbA1c >7.5%). Reasonable glycaemic control can be achieved in the primary health care setting in Sarawak.

Key Words: Hyperglycaemia, Glyclosylated hemoglobin A, Primary healthcare, Sarawak, Malaysia

Introduction

There has not been any study assessing the status of diabetes mellitus control in an urban primary health care clinic with a diabetic clinic run by allied health care personnel in Sarawak. Klinik Kesihatan Tanah Puteh (KK Tanah Puteh) is a primary health care clinic situated in Kuching, Sarawak. A diabetic registry was started in 2000 while a formal diabetic clinic was set up in 2002. This unit was managed by allied health personnel namely a nurse educator and a medical assistant, with the help of the medical officers in the clinic.

The prevalence of diabetes mellitus in Malaysian adults was estimated to be 8.2%[1]. Diabetes has become one of the leading causes of morbidity and mortality globally.

It has been estimated that there would be at least 80 million people with diabetes in South East Asia by the year 2025[2]. Studies have shown that the development of diabetic complications could be delayed or prevented by improving glycaemic control [3, 4, 5].

The American Diabetic Association (ADA) recommended maintaining glycated haemoglobin A1 (HbA1c) levels below 7%, while the International Diabetic Federation (IDF, Europe) has recommended that the HbA1c be maintained below 6.5% [6, 7]. HbA1c levels of more than 7.5% indicate poor control. A Malaysian study in 1998, showed that 73% of the diabetic patients had poor glycaemic control[8]. Omar et al, reported a similar picture in primary care clinics where three quarters of their diabetic patients had suboptimal glycaemic control[9].

Ismail et al, reported that in diabetic patients diagnosed before 40 years of age the overall glycaemic control was poor, with a geometric mean HbA1c of 8.6% whilst 61.1% of the patients had HbA1c greater than 8%[10]. In Singapore, a study showed that 52% of patients had a HbA1c level above 7.5%[11]. The mean HbA1c achieved by the primary health care clinic patients was better than in government hospital patients[12].

Materials and Methods

This is a cross-sectional study describing the glycaemic control of diabetic patients in KK Tanah Puteh conducted from January to March 2003. Diabetes mellitus was diagnosed according to the WHO diagnostic criteria[13]. The treatment targets were based on the recommendation by the IDF[7]. The patients were managed according to the national guidelines and consensus for diabetes, hypertension and hyperlipidaemia[14, 15, 16].

Data were obtained from the clinic based diabetic record cards on a routine basis and captured as they appeared in the medical records. Data fields were left blank if no data were available. We collected information on patient demography, type of diabetes, cardiovascular risk factors (blood pressure, lipids, BMI and smoking history), glycaemic control (HbA1c and fasting capillary blood glucose level, FBG) self-monitoring and renal function (serum creatinine, micro-albuminuria and proteinuria) and treatment rendered (pharmacological and non pharmacological).

Results

Patient demographic characteristics

A total of 1337 cases were recorded in the diabetic clinic register as of 31 December 2002. Table II shows the distribution of follow-up status of these patients. 23% cases were excluded from the final analysis. 1031 cases on active follow-up constituted the final study population.

The ethnic distribution of the diabetic clinic patients and the total adult clinic attendances for 2002 is shown in Table III. Chinese and Malays made up the majority of the study population with 69% and 21% respectively. The Sarawak natives *(bumiputeras)* were under-represented and made up 9% of the diabetic cases against 22% of the total adult attendances in 2002. There were 54 Ibans, 35 Bidayuhs, 4 Melanau and 1 Orang Ulu.

Women outnumbered men 63:37. The majority (89%) were > 45 years of age. 98% of the patients had type 2 diabetes mellitus. 57% of the patients were diagnosed to have diabetes mellitus for less than 5 years while 22% were diagnosed with diabetes for more than 10 years. 6.8% of the cases were still smoking.

Central obesity was assessed according to the measurement of waist circumference[17]. The mean waist circumference was 90 +/- 10cm in the 993 cases with data. More women, 339;(54%) than men, 79;(21%) had central obesity.

The mean BMI was 26.8 +/- 4.5 kg/m^2. The majority of patients had a body mass index in excess of BMI 25kg/m^2. 42.2% were over weight with BMI between 25 to 30 kg/m^2 and 20.6% were obese as with BMI exceeding 30 kg/m^2. (Table V) Obesity is defined as BMI in men >27 kg/m^2; women >26 kg/m^2 in the IDF Asia Pacific (AP) guidelines as in Table I[7]. Using this guideline, 42% of men and 55% of women were obese.

Six-hundred and forty cases had BMI > 25 kg/m^2. 28% were on metformin monotherapy, 12% on sulphonyurea monotherapy and 51% on a combination of sulphonylurea and metformin, and 4% were on diet control. There were no patients on a combination of sulphonylurea and insulin in the overweight/obese group.

There were no correlations between obesity and glycaemic control by both glycated haemoglobin level (HbA1c) and fasting capillary blood glucose (FBG) levels. There were no differences in the HbA1c levels between the patients with normal BMI and obese groups. In the 270 patients with normal BMI, the diabetes control assessed by HbA1c was optimal in 34%, fair in 19% and poor in 47%, whilst in the 362 obese cases it was 32%, 20% and 48% respectively.

Glycaemic control

HbA1c levels were available in 975 cases (95%). The mean HbA1c was 7.4 +/- 1.6%. The mean FBG was 7.9 +/- 2.8 mmol/l. Sixty-two percent of the patients achieved HbA1c level of less than 7.5% and 73% had a HbA1c level of less than 8.0%. Optimal control with HbA1c < 6.5% was achieved in 28% of cases. Fasting capillary blood glucose (FBG) was more than >6.0 mmol/l in 78% of cases.

Figure 1 shows the distribution of glycaemic control using different guidelines proposed by the Asia-Pacific

Type 2 Diabetes Policy Group (IDF-AP) and the American Diabetes Association (ADA). The proportion of poor control was much higher when assessed using the IDF (AP) guidelines 38% (HbA1c AP) than the ADA guidelines 28% (HbA1c ADA). In the 367 cases with poor glycaemic control by HbA1c (AP), 75.6% were on multiple agents, 24.1% were on oral hypoglycaemic monotherapy and 0.3% was on diet control.

The majority (75%) of the 46 patients in the diet control group achieved optimal control, whereas only 14% of the 530 patients on multiple oral hypoglycaemic agents achieved optimal control. Only 42% of cases on oral monotherapy had optimal control. Most cases (87%) on diet only were diabetic for less than 5 years and only 3 cases (7%) were diabetic for more than 10 years.

Patients with longer duration of diabetes were more likely to be on multiple OHA treatment. 144 out of the 218 (66%) patients with diabetes > 10 years were on multiple OHA compared to 241 out of 579 (42%) of patients with diabetes < 5 years. (P<0.05)

There were 382 patients treated with OHA monotherapy. Of this, 75% (287 out of 382) were diabetic for less than 5 years. 14% (53 cases) had diabetes for between 5 to 10 years. Only 11% (42 cases) were diabetic for more than 10 years. Patients on oral hypoglycaemic agents tend to have a worse glyceamic control. 5% of the patients who were on diet only had poor control. 23% (87 of the 379) of patients on oral hypoglycemic monotherapy and 51% (274 of the 538) of patients on multiple oral hypoglycaemic agents had poor control.

Home blood glucose monitoring (HBGM) was performed by 101 patients (10%). In the patients on HBGM 28.2% achieved optimal control while 28.1% of the patients not performing HBGM achieved optimal control. There were no significant differences in glycaemic control when assessed by both HbA1c and fasting capillary blood glucose (FBG) between the two groups of patients.

Fifty-three patients were on insulin. The majority (55%) of these patients had diabetes for more than 10 years, 24% had diabetes for between 5 to 10 years and 21% had diabetes < 5 years duration. Of these, 17 cases were Type-1 DM and 36 cases were Type-2. More patients on insulin than not on insulin had poor glycaemic control. The majority (69%) of patients on insulin had poor control by HbA1c level as compared to 36% of those not on insulin. A similar trend was seen in the FBG where 75% of insulin treated patients and 55% of OHA patient had poor control. Overall, patients on insulin had worse glycaemic control.

AP: Asia Pacific Guidelines[7]
APA: American Diabetic Association Guideline[6]
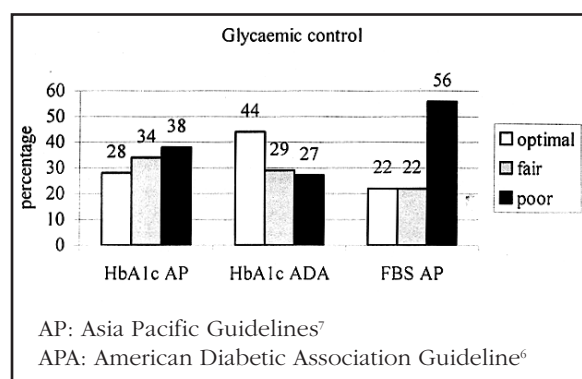
Fig 1: Glycaemic control

Table I: Targets for control

		Optimal	Fair	Poor
Fasting blood glucose (mmol/l)		4.4-6.0	6.1-7.0	>7.0
HbA1c (%)		<6.5	6.5-7.5	>7.5
Blood pressure (mmHg)		<130/80	130/80-140/90	>140/90
BMI (kg/m^2)	Male	<25	25-27	>27
	Female	<24	24-26	>26
Total cholesterol (mmol/l)		<4.5	4.5-6.0	>6.0
Triglycerides (mmol/l)		<1.5	1.5-2.2	>2.2
HDL-cholesterol (mmol/l)		>1.1	0.9-1.1	<0.9
LDL-cholesterol (mmol/l)		2.6-3.0	3.1-4.0	>4.0

The Asian-Pacific Type 2 Diabetes Policy Group. Type 2 Diabetes, Practical targets and treatments, 3rd Ed. 2002: WHO. IDF.[7]

Table II: Distribution of follow-up status

Patient status	n	%
Active	1031	77.1
Defaulted	137	10.2
Dead	20	1.5
No card/ transferred	98	7.3
Duplicate	51	3.8

Table III: Ethnicity

Ethnic distribution	Diabetic cases		Total adult attendance	
	%	n	%	n
Chinese	69.0	711	44.6	24154
Malay	21.2	219	31.0	16886
Sarawak Natives	9.1	94	22.4	12175
Indian	0.5	5	0.3	167
Others	0.2	2	1.9	1047
Total	100.0	1031	100.0	54429

Table IV: Patient Demographics (N=1031)

	Category	%	n
Gender	Male	36.9	380
N= 1031	Female	63.1	651
Age distribution of patients (years)			
Age in years	15-24	0.1	1
	25-34	1.7	18
	35-44	9.4	97
	45-54	24.9	257
	55-64	29.5	304
	65-74	24.3	251
	>74	10.0	103
	Mean age: 59 +/- 12 years		
Type of DM	Type-1 DM	1.6	17
N = 1031	Type-2 DM	98.4	1014
Distribution of duration of diabetes (years) N= 1015 [a]			
Duration of diabetes	1-5 years	57.2	581
	6-10 year	21.2	215
	>10 years	21.6	219
	Mean duration: 6.3 +/- 6.0 years		
Distribution of smoking status			
Smoking status	Non-smoker	87.1	898
	Ex-smoker	6.1	63
	Current smoker	6.8	70

a:16 patients did not have data.

Table V: Body Mass Index Distribution

BMI distribution of patients (kg/m^2) N = 1017[b]

BMI	%	n
<20	4.7	48
20-25	32.3	328
25-30	42.4	431
30-35	15.6	159
>35	5.0	51

Mean BMI: 26.8 +/- 4.5 kg/m^2

b: 14 patients did not have data.

Discussion

Demography

Chinese patients were over-represented in the diabetic clinic and the natives were under-represented. Whether there were real differences in prevalence of diabetes mellitus between the ethnic groups is not known. Glycaemic control in big hospitals in Malaysia is closely related to the ethnic group[10]. It was felt that the Chinese were more concerned with their health and thus more likely to present to a health care facility. Hence they were more likely to be screened for diabetes.

The increasing prevalence of type 2 diabetes mellitus is attributed to various factors including rapid urbanization, rural migration, increasing affluence, obesity and lack of physical activity[18]. This study shows that high body mass index is common in diabetic patients. Obesity and sedentary lifestyle should be addressed in this population and intensive lifestyle intervention may translate into better control[19].

There was no correlation between HbA1c level and body mass index in this study. This could be because the study captures a cross-section in time, and there was a mixture of patients with optimal control who had gained weight and patients who had lost weight due to poor glycaemic control.

Glycaemic control

The glycaemic control achieved by the clinic was better than expected when compared to data from hospitals and other primary health care facilities[8, 9]. The average HbA1c in this study was 7.4% whereas the tertiary hospital average of HbA1c was between 8.6% to 9.1% and the average for East Malaysian states was 9.5%[8, 10]. Optimal control was achieved in 28% of the cases. In the Diabcare study population in the for East Malaysia in 1998, only 3% achieved optimal HbA1c[8]. The marked improvement in glycaemic control cannot be explained by increased awareness alone.

We believe, one reason for the difference was the level of care. KK Tanah Puteh is a primary health care clinic with personnel assigned to run a diabetic unit. Data from the rest of the country is mainly from by general hospitals offering secondary and tertiary care[8]. Most of these hospitals do not run a diabetic clinic paying special attention to the diabetic control. Generally, glycaemic control in big hospitals in Malaysia is poor, and is closely related to the availability of diabetes care facilities[10].

A small diabetic unit offering specialized service has the ability to follow up the patients at a shorter interval than a busy general specialist clinic. Shorter follow-up intervals of 2 to 4 weeks, allow a faster titration of oral agents or insulin[20]. A closer and more intensive control of diabetes mellitus in a diabetic clinic setup could result in better glycaemic control.

Patients diagnosed with diabetes for a longer duration would need more oral hypoglycaemic agent as the disease worsens with time[21]. Glycaemic control may deteriorate progressively with longer duration of diabetes[22]. Patterns of increasing insulin use and decreasing oral agent use with longer duration of diabetes were found in the Third National Health and Nutrition Examination Survey[23]. Our data show that patients who need insulin were more likely to be diabetic for more than 10 years.

Most patients who needed insulin treatment had poor glycaemic control even before starting insulin.

Although 41% had HbA1c below 7.5% there was improvement in glycaemic control after starting insulin. 38% of patients had poor glycaemic control but were not treated with insulin. The small number of patients on insulin suggests under-utilization of insulin. This reflects the resistance to use insulin by the health care provider and the low acceptance of insulin therapy by patients[24, 25]. The use of simpler insulin administration device such as a Novopen[R] may help to overcome the fear of syringes.

Home blood glucose monitoring (HBGM) was still under-utilized. HBGM was performed by 10% of the patients. The main reason cited for the low uptake of home monitoring was the cost of purchasing a machine and the test strips. The utilization of HBGM would increase as patients begin to understand the need to test and fine-tune control. The diabetic educator has an important role in steering the patients' glycaemic control towards treatment targets. The care of diabetic patients requires a team approach with the patient being the most important team member in deciding the treatment, and not merely a participant.

Conclusion

The diabetic clinic in Klinik Kesihatan Tanah Puteh is a unit dedicated to the care of diabetic patients. A diabetic clinic should be set up to manage the diabetic patients rather than a general clinic. Twenty-eight percent of the patients in KK Tanah Puteh achieved the target level of HbA1c <6.5%. The nurse educator can manage the unit with a reasonable glycaemic control in an urban primary care setting in Sarawak.

Acknowledgments

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