ORIGINAL ARTICLE

Diabetic Control Among NIDDM Patients in Urban and Rural Areas in Malaysia

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Summary

Sixty three and fifty nine non-insulin dependent diabetes mellitus (NIDDM) patients in rural (land resettlement scheme) and urban areas respectively were studied to determine factors associated with diabetic control. The anthropometric and metabolic data (HbA1 and fructosamine levels) were analysed. After adjusting for gender, age, body mass index (BMI) and food intake, the fructosamine level which correlates with short term diabetic control, was significantly lower among patients in urban areas compared to patients in rural areas ($p < 0.05$). However, for longer term diabetic control (HbA1 level) the difference was not statistically significant ($p > 0.05$). The socio-economic status, level of education, BMI and types of food did not correlate with diabetic control in either group of patients. More diabetes education is needed together with socio-economic development and changes in lifestyles to enhance compliance towards health and dietary regimens and to achieve better metabolic control.

Key Words: Non insulin dependent diabetes mellitus (NIDDM), Glycosylated hemoglobin (HbA1), Fructosamine, Body mass index (BMI)

Introduction

Non-insulin dependent diabetes mellitus (NIDDM) is a major health problem for many communities[1]. For adult NIDDM, the prevalence is higher in urban than in rural subjects, and in all populations studied, prevalence increases with age[2]. A study done in Malaysia found that the prevalence of NIDDM among Malays was 4.7%. The prevalence among Malays increased with higher levels of social development. Among rural Malays, the crude prevalence of diabetes in traditional villages, in the FELDA land resettlement scheme and urban Malays was 2.8%, 6.7%, and 8.2% respectively[3]. The prevalence of obesity was also high among FELDA land resettlement scheme settlers[3], being 39.1% among males and 50.7% among females. The prevalence of diabetes was found to be significantly higher among obese females. Among Africans in Cape Town, South Africa, increased age, upper segment fat distribution, proportion of life spent in an urban area, and obesity were significant independent risk factors for NIDDM. In contrast, sex, family history, alcohol intake and physical activity were not independent risk factors[4]. Among diabetic patients, obesity was associated with uncontrolled blood glucose level[3]. Diabetes control is often difficult to achieve among persons with NIDDM because of the complexity of health regimen and inability to follow the course of treatment[5]. An unhealthy life-style such as lack of physical activity, stress and over eating worsen metabolic control of NIDDM. On the other hand, lack of medical facilities and poverty may also contribute to poor diabetic control. Thus, the aim of this study is to determine factors associated with diabetic control among NIDDM patients in rural and urban communities in Malaysia.

Methods

Fifty-nine NIDDM patients from urban areas attending the University (UKM) diabetic clinic were selected for the study to represent urban area patients. Eighty NIDDM patients who had registered at Pusat Kesihatan Besar FELDA Sg. Koyan, Raub, Pahang representing the rural area, were recruited for the study. Anthropometric and metabolic data were collected. Weight was measured by SECA spring balance and height by using a microtoise. Body mass index (BMI) was calculated and a cutoff greater than 25 kg/m2 used to indicate obesity[6]. Random blood sugar (RBS) was measured by using Hemo-glucotest strips and reflotron analyzer (Boehringer Mannheim). Venous blood was drawn for glycated hemoglobin (HbA1) and fructosamine measurements. Total HbA1 was measured by microcalorimetric method[7] and fructosamine by commercial assay (Roche Diagnostic).

Statistical analysis

Data was analysed by using SAS statistical package (SAS Institute, USA). T-test was used to compare between groups. P-value less than 0.05 was considered as significant. Multiple regression analysis was used to show a correlation between risk factors and diabetic control, for locations, rural area indicated by 1 and urban area by 2.

Results

Characteristics of NIDDM patients

Table I summarises the characteristics of the NIDDM patients. Sixty-three out of the eighty patients recruited for the study in rural area attended the clinic. The mean (± standard deviation) age among them was 51 ± 10 years and their BMI was 24.5 ± 9.6 kg/m2. On the other hand, the fifty-nine patients in the urban area had mean age of 50 ± 12 years and BMI of 25 ± 7.6 kg/m2. There was no significant differences in the age and BMI of the two groups of patients.

Diabetic control

Short duration diabetic control

Fructosamine levels reflect diabetic status over 2-3 weeks prior to testing[8,9]. There was a significant difference in fructosamine level among rural patients (404.3 ± 158 umol/l) when compared to urban patients (198.0 ± 177.1 umol/l) ($p < 0.05$). Food intake (calories, per cent of carbohydrates and fat intake) did not significantly correlate with fructosamine levels (Table II) ($p > 0.05$). With the use of multivariate regression model, which was controlled for age and sex, fructosamine was a function of location rather than BMI and food intake (r square = 0.3). The equation is: Fructosamine = 610.4 -206.1 (location).

Table I
Characteristics of NIDDM patients in urban and rural areas

	Rural (N=63)	Urban (N=59)
Age (years)	51 ± 10	50 ± 12
BMI (kg/m2)	24.5 ± 9.6	25.0 ± 7.6
Fructosamine (umol/l)	404.3 ± 158.0	198.1 ± 177.1*
HbA1 (%)	6.9 ± 2.6	7.7 ± 3.0

** differed significantly ($p<0.05$) as compared to rural area.*

Long duration diabetic control

Glycosylated hemoglobin level reflects diabetic status over a longer period of about 2-3 months[10]. There was no significant difference in HbA1 level when compared to locations (6.9 ± 2.6% in rural and 7.7 ± 3.0% in urban area) (Table I). HbA1 levels were not significantly correlated with food intake ($p > 0.05$) (Table II).

Discussion

Our study shows that the mean age, BMI and total HbA1 levels were similar in both locations ($p > 0.05$) (Table I). After controlling for age and gender, we found the fructosamine levels differed by locations rather than BMI or food intake. The fructosamine levels, which correlate with short term diabetic control, were lower among patients in urban areas compared to rural areas. This was probably due to patients in urban areas have a better knowledge about the nature, symptoms, complications and treatment of diabetes[11] compared to patients in rural areas. They were more exposed to

Table II
Association between diabetic control and food intake

	Rural		Urban	
	Fructosamine p-value	HbA1	Fructosamine p-value	HbA1
Calories	0.14	0.73	0.80	0.22
% of CHO#	0.50	0.81	0.30	0.31
% of fat	0.13	0.80	0.50	0.90

#CHO: carbohydrates

diabetes and health education either at the diabetic clinics or from the local Diabetes Association. They received a lot of dietary advice from dieticians compared to patients in rural health centre. Besides diabetic education sessions, there are more facilities in urban areas such as aerobic centre, gymnasiums or other recreational places, to increase physical activity. Previous studies have shown that exercise was associated with decrease in plasma glucose levels in NIDDM patients[12], possibly related to an increase insulin sensitivity in muscle and other tissues[13]. Patients in rural areas however do more physical activities and probably compensate for the lack of recreational facilities.

There was no statistically significant ($p > 0.05$) difference in long term (HbA1) diabetic control. Although there are many health educational activities, not all patients comply to advice. Compliers may demonstrate better diabetic control than dropouts[14]. Sometimes they do not receive positive response and support from the care team[15]. Even though types of food and obesity are the most common factor for diabetic control, our study showed that there were no significant correlations between diabetic control, obesity and food intake.

Thus, despite the health facilities available in urban areas, the availability of specialist doctors in diabetes, dieticians, and diabetes education programmes, patients attending the Diabetes and Endocrine Clinics at UKM did not demonstrate better long term diabetes care as assessed by HbA1 or improvement in body weight (BMI) or dietary compliance compared to the poorer rural diabetic patients. However, they did have much better fructosamine levels ($p < 0.05$), implying that these urban patients probably utilized their knowledge of diabetes, diabetic diets and exercise to control their diabetes in the few weeks prior to seeing their diabetic specialists. The rural diabetic patients, with their lack of knowledge, and probably due to their honesty, or lack of threats from the rural health team, did not attempt to improve their diabetes prior to visiting the doctors or rural clinics. Thus their fructosamine level remained high (poor control), consistent with their high HbA1 levels. It is thus important for doctors attending to diabetic patients to be aware of this trend by urban patients and use the HbA1 and body weight as indices of control rather than relying on blood sugars or fructosamine only.

Conclusion

Even though there are many diabetic education programmes in Malaysia to help improve diabetic control, changes in the attitude of the patients play a more important role. Efforts should be directed to improve attitude and compliance, not just to provide knowledge or medications.

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