Awareness of correct blood glucose target among Type 2 diabetic mellitus patient attending diabetic centre of tertiary hospital

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Abstract

Introduction: Many patients are not aware of "treat to targets" concept in the management of diabetes mellitus. Most of them do not achieve the glycaemic control according to the standard guideline.

Objective: The aim of this study is to determine the percentage of type 2 diabetes mellitus patients who are unaware of correct fasting blood glucose (FBG) target and its associated factors.

Methods: A cross-sectional study was conducted among 460 Type 2 diabetes mellitus patients attending diabetes centre of tertiary hospital in Kelantan, Malaysia from July 2010 till September 2010. A pretested self-administered questionnaire was used to determine whether patients had target FBG. Patients were classified as having correct FBG target if their target FBG value was 6 mmol/L and less.

Results: The mean (SD) age of patients was 57.5 (9.37) year old. Majority were Malays and 192 (41.7%) were male with mean (SD) duration of diabetes is 9.9(6.55) years. About 46.7% of diabetic patients were not aware of correct fasting blood sugar target. The associated factors of unaware correct FBG targets were gender, insulin treatment and presence of diabetic booklet. Those who are on insulin or combination therapy has 1.6 times to be unaware [p=0.014, (95% CI 1.1, 2.4)]. Male was 2.0 times to have unaware target compared to female [p<0.001, (95% CI1.4, 3.0)] and having diabetic booklet was 2.3 times the odd to unaware of correct FBG target [p<0.001, (95% CI1.5, 3.5)].

Conclusion: Thus, it is imperative to educate patient on treatment target and improve the utilisation of diabetic booklet in order to help patient achieve glycaemic control.

Keywords: Blood glucose targets, diabetes mellitus, glycaemic control, diabetic booklet

Introduction

In managing diabetes mellitus, glycaemic control can be achieved by targeting fasting blood glucose (FBG), post-prandial and Glycated hemoglobin (HbA1c) according to guidelines.^{1,2} Among these parameters, HbA1c is the gold standard that assists patient to achievement of blood glucose target. HbA1c reflects the glycaemic control over 90 to 120 days and it can be affected by multiple factors.³ Therefore, the monitoring should be performed periodically every 3 months to reflect the glycaemic control and targeted to less than 6.5% to prevent macrovascular and microvascular complications.²

The prevalence of diabetic patients who know the FBG target is low in many documented studies.^{4,5,6} In a study at Pakistan, there were only 21.1% of the study participants who are aware of target fasting blood sugar.⁴ Awad et al reported that in Kuwait, 60% of patients know the correct target for fasting blood sugar but only 5% are aware of HbA1c target.⁵Another study in Pakistan also reported that 17% of the participants knew the correct FBG levels and 22% knew correct random blood glucose level.⁶ It was postulated that increased familiarity of the responders with glucose monitoring parameters of fasting and post-prandial glucose compared to HbA1c results in deficit in HbA1c knowledge.⁵

In Malaysia, there was not much difference between the primary care and the tertiary centers in terms of HbA1c monitoring. Mafauzy reported in the tertiary centers, the mean frequency of testing FBG was 2.71 ± 1.6 times and HbA1c was 2.47 ± 1.0 times with 96.5% of patients had HbA1c performed within last one year.⁷As an alternative, patients were advice for self monitoring blood glucose (SMBG) and had capillary glucose performed at each clinic visit.

Another study at local diabetic clinic in Kelantan revealed 60% of patients did not achieve target fasting plasma glucose, while 72% had HbA1c of more or equal to 7.0%.⁸Study in public hospital also reported that 82% of patients did not achieve this target FBG and had mean FBG of 9.5 ± 4.0 mmol/l in 2003.⁹

In view of the management of diabetes in our setting also depends on the monitoring FBG, capillary glucose or SMBG, it is important to assess the knowledge of correct FBG target which can guide the patient to actively manage their diabetes. It is particularly important in the management of patient who are on insulin where the fasting and pre-meal glucose should be targeted first to reach the glycaemic control.¹⁰ Therefore this study aims to know our patient awareness of the FBG target and factors associated with unawareness of correct FBG target.

Methods

This is cross sectional study conducted from Jun 2010 till August 2010 at Diabetes Mellitus Centre (DMC), Hospital Universiti Sains Malaysia (HUSM) which is located in Kota Bharu, Kelantan. HUSM is a tertiary hospital that provides services to patients from all over Kelantan. Kelantan isastate of Malaysia with population of1.670 million (2012)¹¹ and the prevalence of diabetes of 11.7% were almost similar with prevalence of Malaysia of 11.6%.¹²

Inclusion Criteria were all type 2 DM patients aged 18 years and above who were diagnosed based on WHO 1999 diagnostic criteria for at least one year duration. Those who are pregnant, illiterate and had no blood investigations taken prior to the clinic visitwere excluded.

Total calculated sample size was 460 which include 20% of dropped out using estimate proportion (p = proportion of diabetic patient who do not aware of correct FBG target of 0.53 (from pilot study), precision of 0.05 and Z equal of 1.96.

There were about 60 patients per day at DMC in which it provides services for 4 days per week. At the clinic registration, among participants who fulfill the inclusion and exclusion criteria were selected by systematic random sampling where every second patient registered was selected. The study protocol was explained to the participants and the informed consent was taken. If participants did not agree to be recruited, the participant was excluded from the study. The recruitment continued till the sample size achieved.

For this study, correct FBG target is defined as having FBG target of less or equal to 6 mmol/L. Awareness of FBG target is considered if the patient has the ability to state the correct FBG target based on his opinion regarding the value that he should achieved and not based on the value that the health personnel has set on him.

All collected data were analyzed using the Statistical Program for Social Sciences (SPSS) software version 18.0. Descriptive analysis for categorical variable was presented as the frequency and percentage. The numerical variable was presented as mean and standard deviation (SD) for normally distributed data. The dependent variable was unawareness of correct FBG target. The independent variables were age, gender, race, education, employment, duration of DM, DM complications, types of treatment, self monitoring blood glucose (SMBG), presence of diabetic booklet, systolic blood pressure (SBP), diastolic blood pressure (DBP), body mass index (BMI) and HbA1c.

Results

A total of 460 patients were enrolled in the study, with mean (SD) age was 57.5 (9.37) and mean (SD) duration of the diabetes was 9.9(6.55) years. About half of participants were on oral hypoglycaemic agent (OHA) and majority had poor glycaemic control with only 31.5% achieved FBG target and 19.1% achieved HbA1c of less than 7.0%. The details of the demographic and clinical characteristic are shown in Table 1.

Figure 1 showed the percentage of participants who awareof correct FBG target. Of all the participants, 215 (46.7%) were unaware of the correct FBG target.

From multiple logistic regression analysis, patients on insulin or with combination therapy has 1.6 times the odds compared to participants on OHA for being unaware of correct FBG target (95% CI 1.1,2.4, p=0.014) Men have 2.0 times the odds compared to women for being unaware of correct FBG target (95% CI 1.4,3.0, p<0.001) Participant who has diabetic booklet has 2.3 times the odds compared to those without the booklet for being unaware of correct FBG target (95% CI 1.5,3.5, p<0.001) when adjusted for treatment and gender.

Discussion

In achieving good glycaemic control, setting a target would assist the physician and the patient to strengthen the diabetes management. In our study, 46.7% of diabetic patients were not aware of correct FBG target. Few other studies reported a proportion of patient whowere not aware of FBG target varies from 20.7% - 83%.^{5, 6,13, 14} The awareness of FBG target could be attributed by the familiarity of patients with the glucose monitoring at the clinic and at home.⁵

The factors associated with unawareness of correct FBG target were gender, types of treatment and presence of diabetic green book. Our study showed that male has 2 times the odds compared to women for being unaware of correct FBG target. This could be because of women were more concerned about getting their glucose controlled; furthermore 58.3% of patients were female in our study. Other studies also showed that female and those with higher education were more willing to take responsibility for their diabetes.¹⁵ In contrast Rampal et al reported that the awareness, treatment and control of diabetes had no significant difference between men and women. There were also no association found between the awareness and educational level of diabetic patient.¹⁶

It is postulated that insulin treatment imposes more knowledge to the patienton the FBG target as patients are more actively involved in the management especially for self-titrating regime. In our study, percentages of patients who ever perform home-monitoring blood glucose (50.7%) and patients who were on insulin (45.7%) were almost similar. In contrast with our finding, Mastura et al reported only 15.3% of diabetic patients at primary care perform SMBG and insulin were associated with increased SMBG practice, good glycaemic control and good diabetic knowledge.¹⁷

Our analysis shows patients on insulin or combination therapy has 1.6 times the odds compared to participants on OHA for being unaware of correct FBG target. This finding could be explained by the possibility of our participants who did not actively manage their blood glucose which made them ignorant about the FBG target. Studies in Pakistan also showed that 75% of patients that were on insulin did not change the insulin dose as required.¹⁴

Participants who have diabetic booklet have 2.3 times the odds compared to those without the booklet for being unaware of correct FBG target when adjusted for treatment and gender. A study done in the Netherlands revealed that patients with diabetic passport were associated with

better glycaemic control and achieved HbA1c target.¹⁸ Our study had a contradicting finding since the usage of diabetic booklet is low in which only 28.9% of patients were using it. In comparison with health clinic practice in Malaysia, the diabetic booklet utilization is very high and patients were requested to bring it at each visit. It has been used as a reference regarding treatment regime and other clinical and laboratory parameters. However, at DMC, the patients' medical record and electronic medical records regarding treatment regime and laboratory parameters were accessible at each visit. This had led to underutilization of diabetic booklet since the clinical data access was not through the diabetic booklet.

Education could contribute to the knowledge of correct FBG target. If education can be strengthened, the awareness on correct FBG target will be higher among diabetes patients. Majority of patients at northern Malaysia gained knowledge about diabetes from health care professionals followed by relatives and/or friends and books and/or magazines.¹⁹ Therefore, the health-care provider should take more effort to provide health educationduring the care of diabetic patient.

FBG target should be emphasized to the patients to inculcate awareness and involve them in diabetes management. In diabetes management, targeting the FBG is reasonable since post-prandial glucose can be affected by many factors such as activity, insulin sensitivity, gastric emptying rate and types of meal.²⁰

Conclusions

The proportion of patients who were unaware of correct FBG target varies between studies with regard to different socio-demographic and clinical background of the patients. About 46% of diabetic patients in our study are either unaware of correct FBG target or they have an incorrect FBG target which could contribute to uncontrolled status of their DM. Factors that have been identified contributing to this were patients who were on insulin only or combination therapy, male gender and patients who were using diabetic green book as part of diabetes management. These finding should be interpreted cautiously and further study need to be done to identify other possible confounders that might influence the awareness of correct FBG target such as patient's knowledge, attitude, lifestyle and adherence to treatment regime. The study should also be conducted at government health clinics to review whether the diabetic booklet utilisation shows any different results.

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Competing interests: NIL

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Variables	Mean (SD)	n (%)
Age (years)	57.54 (9.37)	
Gender		
Male		192 (41.7)
Female		268 (58.3)
Race		
Non-Malay		25 (5.4)
Malay		435 (94.6)
Education level		
Primary		123 (26 7)
Secondary/Tertiary		337 (73 3)
Employment		
Unemployed		308 (67 0)
Employed		152(330)
Duration of diabetes (years)	9 92 (6 55)	102 (00.0)
DM complications *).)2 (0.33)	
No		282 (61 3)
Ves		178 (38 7)
Concomitant medical illnesses*		170 (30.7)
No		5 (1 1)
Ves		455 (98 9)
Type of treatment		+55 (56.5)
OHA only		250 (54 3)
Insulin/combination		210 (45 7)
Systelic blood pressure (mmHg)		210 (45.7)
>130		181 (39 3)
< 130		279 (60 7)
Diastolic blood pressure (mmHg)		217 (00.1)
> 80		122 (26.5)
< 80		338(735)
$\underline{-}$ 00 Body mass index(kg/m2)		556 (75.5)
>23.0		402 (87 4)
<23.0		58 (12.6)
Easting blood glucose (mmol/L)		58 (12.0)
		315 (68 5)
<6.0		145 (31 5)
$\frac{-0.0}{\text{Hb} \Delta \ln (\%)}$		170 (31.3)
>7.0		372 (80.0)
<70		372(00.7) 88(101)
NBC		00 (17.1)
		227(40.2)
		227 (49.3)
Too Dresence of disbetic booklet		233 (30.7)
No		377 (71-1)
		327(71.1) 133(22.0)
1 05		133 (28.9)

 Table 1: Demographic and clinical characteristic of participants)

*Each patient might have more than one complications or concomitant illnesses



Figure 1: Proportion of participants who are aware of FBG target)

Variables	Adjusted OR ^a	95% CI ^b	Wald stat ^c	p-value
Gender				
Female	1.0			
Male	2.0	1.4,3.0	12.52	< 0.001
Treatment				
OHA only	1.0			
Insulin/combination	1.6	1.1,2.4	5.99	0.014
Diabetic booklet				
No	1.0			
Yes	2.3	1.5,3.5	14.84	< 0.001

Table 2: Factors Associated for unaware of correctFBG target by multiple logistic regressions

^a Adjusted Odds ratio

Backward LR Multiple Logistic Regression model adjusted for gender, education, employment, types of treatment, home monitoring blood glucose, presence of diabetic green book, complications and BMI

^b Confidence intervals

^c Wald statistics