The validity of fasting blood glucose and post-prandial blood glucose measurement as an index of glycaemic control in Sri Lankan patients with type 2 diabetes

Maintaining tight metabolic control with HbA_1c values below 7.5% prevents the onset of complications in patients with type 2 diabetes [1]. Fasting blood glucose (FBG) has been shown to correlate well with long term indicators of glycaemic control such as HbA_1c [2]. The post-prandial blood glucose (PPBG) is commonly used as a surrogate index of glycaemic control as facilities to perform HbA_1c are not available in Sri Lankan state hospitals.

Data on the validity of PPBG is scarce but random blood glucose has been used in resource poor settings in Africa [3]. We, therefore, compared the validity of FBG and PPBG levels in determining glycaemic control using HbA_1c as the gold standard.

Our study population consisted of a total of 296 patients with type 2 diabetes, visiting a medical clinic. HbA_1c, PPBG levels and FBG levels were assessed on these patients on the same day. FBS was performed after an overnight 10 hour fast and PPBG was performed on blood samples taken 2 hours after the midday meal. HbA_1c was also performed on these patients to find out which variable best reflected good glycaemic control as defined by a HbA_1c level below 7.5%.

The correlation coefficients with 95% confidence intervals were calculated and the data plotted on scatter graphs. Sensitivity, specificity and likelihood ratios (LR) for identifying those with a HbA_1c of 7.5 or less were calculated for different levels of FBS and PPBS (Table 1).

In our study population, the mean values for FBG was 8.4 mmol/L (SD 2.7) while the means for PPBG and HbA_1c were 13.4 mmol/L (SD 3.1) and 8.3 (SD 2.0). There was a significant positive correlation between FBG and HbA_1c where the correlation coefficient (R^2) was 0.653 ($p > 0.001$). However, the correlation coefficient value for PPBG and HbA_1c was only 0.245. The likelihood ratio for a (positive test) FBG of less than 5 mmol/L in confirming good control as defined by a HbA_1c of 7.5 was 12. The likelihood ratio (LR) for a FBG greater than 9 mmol/L in ruling out a HbA_1c less than 7.5 was 0.08. Likelihood ratios for PPBG were below 10 for a positive test (below 9 mmol/L LR 6, below 10 mmol/L LR 8.75, below 11 mmol/L LR 5.89 or below 12 mmol/L LR 3.89) and above 0.1 for a negative test (above 9 mmol/L LR 0.9, above 10 mmol/L LR 0.68, above 11 mmol/L LR 0.52 or above 12 mmol/L LR 0.37). A likelihood ratio above 10 and below 0.1 is considered as strong evidence to confirm or exclude disease states. Hence FBG measurements appear to be a more reliable indicator of HbA_1c than PPBS. A FBG below 5 mmol/L can be assumed to indicate good control ($HbA_1c < 7.5$), while a FBG greater than 9 mmol/L indicates poor control ($HbA_1c > 7.5$).

We, therefore, recommend the use of FBG as a surrogate index of glycaemic control in patients with type 2 diabetes mellitus.

References

1. UK Prospective Diabetes Study Group. Effects of intensive blood glucose control with sulphonylureas or insulin compared with conventional treatment and risk of diabetes in patients with type 2 diabetes (UKPDS 33). *Lancet* 1998; **332:** 837–53.
2. Holman RR, Turner RC. The basal plasma glucose: a simple relevant index of maturity onset diabetes. *Clinical Endocrinology* 1980; **14:** 279–86.

Table 1. **Likelihood ratios, sensitivity and specificity for different blood glucose levels in predicting good glycaemic control as defined by a HbA_1c below 7.5%**

Fasting Blood Glucose (FBG)	*Sensitivity*	*Specificity*	*Likelihood ratio of a HbA_1c <7.5*	*Likelihood ratio of a HbA_1c <7.5*
FBG <5mmol/L	0.12	0.99	**12**	0.89
FBG <6mmol/L	0.43	0.92	5.38	0.62
FBG <7mmol/L	0.66	0.85	4.4	0.40
FBG <8mmol/L	0.86	0.72	3.77	0.19
FBG <9mmol/L	0.95	0.61	2.44	**0.08**
FBG <10mmol/L	0.98	0.46	1.81	**0.04**
PPBG <8mmol/L	0.01	1	—	0.99
PPBG <9mmol/L	0.12	1	6	0.9
PPBG <10mmol/L	0.35	0.97	8.75	0.68
PPBG <11mmol/L	0.53	0.97	5.89	0.52
PPBG <12mmol/L	0.70	0.86	3.89	0.37

FBG = fasting blood glucose, PPBG = post-prandial blood glucose

3. Rotchford AP, Rotchford KM, Machattie T, Gill GV. Assessing diabetic control- reliability of methods available in resource poor settings. *Diabetic Medicine* 2002; **19:** 195–200.

GN Malavige, *Demonstrator,* **N Weerasooriya**, *Registrar,* **NMW de Alwis**, *Lecturer,* **DJS Fernando**, *Professor, Department of Medicine, Faculty of Medical Sciences, University of Sri Jayawardenepura.*
Correspondence: DJSF, *e-mail:<devaka.fernando@sfh-tr.nhs.uk> , <d.fernando@sheffield.ac.uk>. (Competing interests: none declared).*