SELF-MONITORING OF BLOOD GLUCOSE IN TYPE 2 DIABETES

This is a summary: the full paper can be accessed at nursingtimes.net

AUTHORS Elizabeth A.C. Haidar, MSc, BSc, AHEA, RN, is lecturer and advanced nurse practitioner, King’s College London; Andrew C. Burden, FRCP, MD, is community diabetologist, Heart of Birmingham Teaching PCT; John R. Skelton, MRCGP, MA, BA, RSA, is professor of clinical communication, University of Birmingham.


The aim of this study was to assess the effect of self-monitoring of blood glucose (SMBG) on glycaemic control in type 2 diabetes. An observational prospective study with historical controls was carried out in a socially deprived general practice. HbA1c and fasting blood glucose (FBG) were checked at three, six and nine months and compared with baseline data. There was a significant difference between pre-SMBG HbA1c (mean 9.8%, SD +/-2.4) and post-SMBG (mean 8.5%, SD+/-2.1). SMBG improved glycaemic control in patients with type 2 diabetes.

INTRODUCTION

Since many patients diagnosed with type 2 diabetes have had the condition for several years, they commonly have micro/ macrovascular diabetic complications. It is therefore vital to achieve and maintain normoglycaemia – a 1% reduction in HbA1c will give a 21% decrease in any diabetes-related complication (UKPDS, 2000).

Although the amended consensus guidelines for type 2 diabetes (Ovens et al., 2004; American Diabetes Association, 1997) confirm that diabetic control can be aided by the self-monitoring of blood glucose (SMBG), in the literature the value of SMBG in patients with type 2 diabetes treated with oral hypoglycaemic agents is controversial (Harris, 2001; UKPDS, 2000).

There is a lack of evidence from randomised controlled clinical trials to support SMBG in the treatment of type 2 diabetes, and results from meta-analyses are inconclusive (Harris, 2001). The purpose of this study was to investigate the effect of SMBG on glycaemic control. A literature review was carried out – for details see nursingtimes.net.

MATERIALS AND METHOD

This study was carried out between February 2004 and February 2005. Participants were recruited from a new diabetes clinic in an inner-city GP practice serving patients of South Asian origin in Birmingham. The clinic was run by an advanced nurse practitioner (ANP).

Participants were each given a glucometer (MediSense Optium Plus), educated and shown how to perform SMBG. Their HbA1c and fasting blood glucose (FBG) were checked at three, six and nine months following the introduction of SMBG. The outcome was compared with baseline tests that had been performed three, six and nine months before participants started SMBG.

Patients were recruited through the diabetes clinic as a convenience sample, with the following inclusion criteria:

- Type 2 diabetes;
- Taking sulphonylureas and/or biguanides;
- Poor control, with HbA1c above 7%;
- Full consent.

The diabetes clinic was set up recently in the treatment of type 2 diabetes. The purpose of this study was to investigate the effect of SMBG on glycaemic control. A literature review was carried out – for details see nursingtimes.net.
The Student’s t-test showed a significant difference between the averages of the three pre-SMBG measurements for FBG and the three post-SMBG measurements; the p value was 3.91E-13. Also, there was a significant difference between the averages of the three pre-SMBG measurements of HbA1c and those of the three post-SMBG measurements; the p value was 3.27E-16.

The one-way ANOVA was performed for HbA1c measurements over the six occasions. The chosen \( \alpha \) was 0.05, F (found in F-distribution table) was 2.21 and the calculated F was 8.87. Since the calculated F was larger than 2.21, the null hypothesis was rejected and there was significant difference between the pre and post results.

The Pearson correlation coefficient did not reveal any correlation between age and the change of FBG (the difference between the pre and post averages) \( R = 0.11 \). Also, there was no correlation between age and the change of HbA1c (the difference between the pre and post averages) \( R = 0.27 \).

With regard to sex, men showed a higher response than women. At the end of the study, 23 patients achieved HbA1c of \( \leq 7\% \). Of these, 14 were men (40\% of the total of 35 men) and nine were women (28\% of the total of 32 women).

In the nine months before the intervention, five patients had achieved that outcome.

**DISCUSSION**

HbA1c showed continuous decrease over the nine months following the intervention. However, the measurements from the pre-intervention period showed the HbA1c to be slowly improving. This could be attributed to the influence of education through the diabetes clinic and the ANP’s role. The improvement in HbA1c following SMBG was more significant. Men fared marginally better. This could be because the invasiveness of the SMBG procedure made women more reluctant to perform it frequently.

It was explained to patients when they could perform SMBG but they were not restricted to a specified frequency. The requirement for minimal disruption in this busy inner-city general practice and the limited number of glucometers did not allow for random allocation.

The participants were ‘regular attenders’, were English speaking, had been in England for many years and had a general interest in their glycaemic control. In addition, many were related and could motivate each other to control their blood glucose. Furthermore, all were willing to participate. Since all the above factors can cause selection bias, it is doubtful that all patients would have the same enthusiasm for SMBG. Patients also received regular feedback and this probably helped to improve their results. This is in accordance with other studies.

Another pitfall in this study is that there was a slight improvement in the glycaemic control in the pre-intervention period; this was attributed to the new diabetes clinic, education and the role of the ANP.

Therefore, although there was a statistically significant difference between the pre and post improvements, it is difficult to attribute the post-intervention improvement solely to the SMBG. It may have been a good idea to compare the post-intervention measurements with those taken before the diabetes clinic was set up but patients were not seen regularly before this and no data was collected.

It would have been helpful to produce a questionnaire to identify what patients felt helped them to control their glycaemia, such as the education, SMBG, dietary advice, diabetes clinic, effect of the medication or a combination of all these. Similarly, it is hoped that the improved glycaemic control achieved is not due to the ‘Hawthorne effect’, in which a change such as the introduction of the diabetes clinic or SMBG leads to a temporary change in behaviour.

The strength of this study lies in its prospective nature, its power of 80\% and the large sample size of 67 patients. The regular attendance of participants was remarkable and the follow-up was good (18 months). Only 33 patients were lost from the study; seven converted to insulin and one became pregnant.

**CONCLUSION**

SMBG was effective in improving glycaemic control in South Asian patients with type 2 diabetes who are on oral hypoglycaemic agents. The effect included improvements in both HbA1c and FBG. SMBG was beneficial and could be used along with other methods such as education, diet, exercise and medications. To fully assess its effects in the community as a whole, a large and well-designed RCT is required. Additional work is needed to establish optimal frequency and timing of SMBG.