

Finding diabetics — a method of screening in general practice

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C KEYWORDH

SUMMARY

Background. *It is well known that many diabetic patients go undiagnosed until complications have started to develop. Screening can be expensive in time and money, and ineffective, and is therefore unpopular with general practitioners (GPs).*

Aim. *This study aimed to develop a screening method that was cost-effective and practical within the setting of an ordinary general practice.*

Method. *Urine-testing sticks for glucose were sent with an explanatory letter to all (1736) non-diabetic subjects over 50 years old in a general practice. At the same time, diabetic recall and care were audited and improved in the practice.*

Results. *Reply slips were received from 1204 patients (69.4%). Of these, 2.6% were positive and 97.4% were negative. Eight new diabetic patients were therefore found at a cost of £78.25 each.*

Conclusion. *This method of screening a selected part of a general practice population is practical and effective. Apart from the human cost, the financial cost of finding a new diabetic patient is small compared with that of caring for a diabetic patient who is blind or an amputee.*

Keywords: diabetes; screening; general practice.

Introduction

THE World Health Organization (WHO), in its 1994 report on the prevention of diabetes mellitus,¹ contained an appendix on the characteristics of good screening. These included the ability to identify a disease that is important and severe, that has a detectable preclinical phase, and for which there is an effective treatment. Diabetes fulfils all these requirements.

In 1980, the same WHO working group² estimated that the incidence of diabetes is between 3% and 6% (half undiagnosed). There is little evidence to suggest that this figure has altered for the better since.

The purpose of good screening is to detect disease before it would normally come to the attention of health professionals, so that the disease can be treated and the outcome improved. Diabetes is an important disease in this respect because complications can ensue before diagnosis. In a study carried out by the UK Prospective Diabetes Study Group,³ for example, 22% of white men and 16% of white women already had retinopathy at diagnosis. Early detection and treatment, such as laser treatment, can considerably reduce visual loss in this condition.

Since the new general practice contract of 1990, health promotion has formed an important part of the work expected of GPs. There has been much controversy over the amount of work involved and the effectiveness of the measurements required. The most recent arrangements for health promotion in the dia-

betic field⁴ include putting all diabetic patients on a practice disease register, recalling them for checks, giving them management plans, educating them about the disease and referring them if necessary. All this should help the management of known diabetic patients. However, no mention is made of searching for new diabetic patients. New patient checks may include a urine test for glucose, but there is a very low uptake in an untargeted, mainly young population. The returns are very small. An argument could be put forward for carrying out screening programmes such as the one outlined here. If some extra resources were available for this, better methods could be used, as discussed below.

Davies *et al*⁵ compared testing urine one hour after the main meal with testing twice: before and one hour after breakfast. Testing after the main meal only was more specific. In the 1960s, a working party for the Royal College of General Practitioners⁶ (RCGP) had evaluated the method of asking members of the general population to bring a urine sample for testing. They achieved a response rate of only 36%.

We therefore looked for a method of finding diabetic patients at an early stage, which was practical and cost-effective, would achieve a good response rate, and could be conducted entirely in a general practice setting. We decided to target a high-risk group by selecting the over-fifties. This was because the majority of undetected diabetic patients are maturity-onset diabetics with minimal or no symptoms. However, they are often aware that they are at higher risk of disease than young people and so are more likely to cooperate with a screening programme.

Method

The practice age-sex register was used to identify all patients over 50 years of age. It also produced a list of all diabetic patients (85, or 1.39% of the practice population), who were excluded. A total of 1736 patients remained.

A letter was prepared explaining the object of the study to the patients. This was signed by the practice nurse (CK) and a GP (SB). A dipstick that detects glucose in urine by the glucose oxidase method was attached to the letter (Diastix). The patients were asked to dip this into a specimen of their urine collected between one and two hours after their main meal of the day. This timespan covered the time of maximum blood sugar after a meal. A return slip was attached to the letter, on which they were asked to record their name, address and the result of the test, whether positive or negative, and return it to the surgery. The use of stamped addressed envelopes was considered, but it was decided that it would be too expensive in terms of postage, envelopes, labels and time.

Patients with positive results, and anyone who was unsure, had another urine test, a random blood sugar test and an HbA1c test (where appropriate) carried out by the practice nurse (see Results section for normal ranges). At the same time, the diabetic care of a sample of the known diabetic patients was audited and an annual recall system was instituted.

Newly diagnosed diabetic patients were seen by their GP and treatment was started in the usual way. Within two months, all the new diabetic patients were called for an annual check along with the established diabetic patients. The practice nurse carried

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out foot inspections, measured blood pressure, and performed urine and blood tests. The GP carried out fundoscopy with dilated pupils.

A decision was made not to follow up non-responders, as this would have been very heavy on resources. It was considered that non-responders were more likely to be negative than positive since, if they were symptomatic or had tried the test and found it positive, they would probably have contacted us.

The response rate, the proportion of newly diagnosed diabetic patients and the false positive rate were calculated. Patients with glycosuria but with a normal result from their blood test were advised to have the tests repeated in one year (one of them has since become an overt diabetic but is not included among the diabetic patients found during the study). The costs of the method were calculated as a total and as a cost per newly diagnosed diabetic patient.

Results

A total of 1736 letters were sent out and 1204 replies were received — a response rate of 69.4%. Of these, 32 (2.6%) were positive and 1172 (97.4%) were negative. Anyone who was unsure of the result was asked to bring another sample to be checked.

Unfortunately, some people had returned the reply slip without filling in the result. An attempt was made by the practice nurse to contact these people by telephone. A few people filled in the result but not their names and addresses (these people were excluded from the figures). Fortunately, only one of these was positive. Fifteen of those who stated that their urine was positive for sugar said, when contacted, that they had made a mistake and that the urine was negative. Therefore, 17 patients needed further tests. All (100%) of these attended for blood tests after follow-up and persuasion by the nurse. Some showed surprisingly negative attitudes to the diagnosis of an illness, and in some cases a lot of persuasion was necessary to get the patient to agree to follow-up and treatment. Three of the new diabetic patients were already symptomatic; not surprisingly, these were the ones with blood sugars over 20. The results are shown in Table 1.

Results were judged according to laboratory guidelines as diagnostic or equivocal. In the latter case, HbA1c was measured. Normal ranges given by Dewsbury District Hospital Laboratory, where all our tests were carried out, were: fasting blood sugar, 2.5–6.0 mmol/l; random blood sugar, 2.5–8.0 mmol/l. On random samples, a result greater than 11 mmol/l is said to be diagnostic of diabetes mellitus, according to WHO recommended guidelines. In this study, a result exceeding 8.0 mmol/l but less than 11 mmol/l was considered equivocal. HbA1c levels, according to Dewsbury District Hospital Laboratory, are: <7.5%, well controlled; 7.5–10.0%, poorly controlled; >10%, uncontrolled.

Eight new diabetic patients were therefore diagnosed. This was 47% of those with glycosuria and 6.5% of those who replied. One subject who had glycosuria but normal random sugar and HbA1c levels has since developed diabetes. New diabetic patients were referred to the doctor and entered on the practice computerized disease register. The urine test therefore had a false-positive rate of 53%. The costs of the initiative to find undiagnosed diabetic patients are shown in Table 2. This brings the proportion of newly diagnosed diabetic patients in the practice to 1.5%.

Discussion

This method proved to be a practical way of screening the most

at-risk population. The response rate (69.4%) was much better than that achieved by the RCGP working party (36%),⁶ which attempted the screening of a large population by asking them to provide urine samples. This was probably because a group at higher than average risk of the disease was contacted by professionals whom they knew from their own practice. Also, they were able to carry out the test privately at home. This disposed of the practical difficulties and embarrassments of finding a container, filling it and travelling to the surgery with it. The results could be posted and, of course, if the result was positive, the motivation to return the result would be high. The negative attitudes shown by some patients to admitting they had an illness would be a fascinating topic for further research.

A few problems were encountered because of some patients' difficulties with filling in the return slip. Some could be contacted by telephone, but some had not given a name or address. (Fortunately, only one of these was positive. It is to be hoped that this person was diagnosed soon.) The only way to have prevented these problems would have been to put each patient's address on the return slip, perhaps with a sticky label. However, this would have increased the costs and labour considerably. In order to work, the scheme must be kept as simple and cheap as possible.

The false positive rate of 53% compares well with the 72% rate found by Davis *et al.*⁵ Some of these will have a low renal threshold and some an impaired glucose tolerance. The use of

Table 1. Results of the screening initiative.

Patient number	Blood sugar	HbA1c (where appropriate) (%)
1	23.5	
2	14.7	7.4%
3	6.2	
4	5.5	
5	14.2	7.5%
6	7.4	6.4%
7	25.1	9.9%
8	7.7	
9	13.9	7.6%
10	10.1	8.2%
11	5.6	
12	4.9	
13	7.4	
14	13.9	8.4%
15	6.8	
16	7.4	
17	20.4	11.2%

Interpretation of blood sugar levels at Dewsbury District Hospital Laboratory. Random blood sugar: 2.5–8.0 mmol/l normal; >11 mmol/l diagnostic of diabetes. HbA1c: < 7.5% well-controlled diabetes; 7.5–10% poorly controlled diabetes; > 10% uncontrolled dia-

Table 2. Costs incurred during the screening process.

Urine glucose diagnostic sticks	£126.00
Posters and letters	£100.00
Stationery	£40.00
Postage	£360.00
Total	£626.00
Cost per newly diagnosed diabetic	£78.25

No costing was made for labour as this was done in spare moments by our enthusiastic staff.

the glycosylated haemoglobin measurement helps to give a definite diagnosis in equivocal cases. This is probably a simpler and more useful measurement than a glucose tolerance test if one is looking for actual diabetic patients. The request to the patients in our study with glycosuria only, to have their blood test repeated after a year, is important; one patient has subsequently become diabetic.

There is a risk that patients made an error on the return slips by deleting 'positive' when they meant to delete 'negative', since we found that 15 patients had done the opposite. This a difficult problem to overcome with this method of screening. Gains were probably made by giving the patients a screening method they could carry out in the privacy of their own homes, but losses were made in that people who find all form-filling difficult could make errors in their returns. New diabetic patients were found during this initiative, so some gains were made even if a few were missed in this way. Perhaps asking the patient to write 'yes' or 'no' instead of deleting words would have been better.

A check on new diabetic patients in the practice since this testing shows that, in the three years since the original study, six other patients have become diabetic. Those tested did not have glycosuria at the time of testing, but it is reasonable to suppose that they had some impairment of glucose tolerance insufficient to exceed the renal threshold one to two hours after the main meal. Glucose tolerance tests would have given more accurate results but would have greatly increased the costs and time needed. It was considered of paramount importance, if the method was to work in a normal, small general practice, to keep it simple, without great time or money implications. Four new diabetic patients were under 50 years of age at the time of screening. Perhaps we should extend the target group to the over-45s. It is probably more valuable to repeat the described screening method regularly, perhaps every five years.

Davies *et al*⁵ demonstrated that postprandial testing gave more reliable results than preprandial testing. We, therefore, used this method and achieved a higher genuine positive rate than they did. The reason for the size of the difference is not clear.

The cost of diagnosing each new diabetic patient was less than £80. This cost is tiny compared with the cost of the care of patients with peripheral vascular disease or an amputation, for example.⁷

The method appeared to be very acceptable to patients, judging by the comments that doctors, nurse and staff received. However, it has been shown⁸ that anxiety levels can be raised by a screening programme to a worrying extent. We attempted to overcome that by asking anyone who was worried or doubtful to contact us. The names of the key workers were on the letter sent out, providing easy access to known professionals to allay anxieties.

As mentioned, health promotion is an important topic for GPs these days, and they are paid for chronic disease management. No money is currently available for a screening programme such as this. With more funds, we could have paid for more clerical help and provided stamped, addressed envelopes and individualized letters with the patient's name and address on the reply slip. This would have prevented the cases in which people forgot to put their names and addresses on the reply slips. Glucose tolerance tests would have cost money in terms of nurse time, but would have given clearer results in the borderline cases. Fundholding practices would need money to pay for all the laboratory tests they carried out. It is likely that the scheme would still be highly cost-effective, but further studies would be needed to elucidate this, as it is a topic of immediate

importance at a time when the health promotion arrangements have again been altered by the government.

Our method of screening a targeted group is therefore a practical method for many general practices to pursue and is acceptable to most patients. It achieves its object of finding unknown diabetic patients with the minimum expenditure of resources.

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