

Effect of culturally appropriate health education on glycaemic control and knowledge of diabetes in British Pakistani women with type 2 diabetes mellitus

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Abstract:

Type 2 diabetes is a growing problem in people of South Asian origin. It is associated with severe complications if it is not adequately controlled. This paper is a secondary assessment of 105 British Pakistani women within a larger randomized controlled trial of 200 Pakistani patients with diabetes. The trial used one-to-one structured diabetes health education, delivered by a linkworker with pictorial flashcards as a visual aid. Earlier published results from this study have shown that the women in the study knew less about diabetes and had poorer glycaemic control than men, which is why this assessment was performed to see what happened to them when they received appropriate health education. All patients were assessed before and 6 months after intervention by questionnaire and haemoglobin A1c blood tests to measure their overall blood sugar control. Nearly everyone improved their knowledge scores after 6 months in the intervention group, with women showing a catch-up improvement such that they equalled men. Multiple regression analysis found that glycaemic control improved in women receiving health education. Although this method of health education improved knowledge and glycaemic control in women in this sample, illiterate women did not do as well as

their literate peers, continuing to score less on knowledge parameters. They also did not show an improvement in glycaemic control. Further work is needed to discover methods that will reach this sizeable subsection of the community.

Introduction

Type 2 diabetes mellitus is a common problem in Britain, with an overall prevalence of about 2% of the population. It is associated with severe complications such as ischaemic heart disease, stroke, kidney and foot problems. However, it is up to four times commoner than this among people originating from the Indian subcontinent (referred to here as 'South Asians' except where ethnic origin is precisely known), with nearly 20% of people over 65 years of age affected in some communities (Mather and Keen, 1985; Simmons *et al.*, 1989). As it is now known that the potentially serious complications of type 2 diabetes can be prevented by tight blood pressure and blood sugar control (DCCT Research Group, 1993; UK Prospective Diabetes Study Group, 1998), it has become vital that culturally acceptable, good quality health education techniques are developed that will extend to all sections of this sometimes 'hard to reach' population (Nolde and Smillie, 1987). This is not intended as a pejorative term, as it is a health service reality. Many patients do not speak or read in English, interpreters are still not widely available except by prior arrangement, and cultural and religious *mores* make it difficult for patients to attend clinics at certain times or on certain days, to speak openly to members of the opposite sex, or for women to travel alone to clinic appointments

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(Shah and Piracha, 1993). In addition, since the current age profile of South Asian communities in Britain shows that over 50% are still under the age of 30 years, we can expect a further increase in prevalence of diabetes as this population ages (Office of Population Censuses and Surveys, 1983). Two comparative studies of different South Asian communities in Coventry and Nottingham have shown that South Asians with diabetes know less about it and its management than otherwise similar white patients (Hawthorne, 1990; Simmons *et al.*, 1991). Although improvements in knowledge scores do not necessarily result in improvements in health status (Bloomgarden *et al.*, 1987), it is still generally held that an understanding of the principles of diabetes management is one of the cornerstones leading to better outcomes in a motivated person (Calman, 1998). Patients themselves are keen to learn more about diabetes, especially about an appropriate diet, since food value beliefs are already culturally important determinants of health in traditional thinking (Webb, 1979; Bhopal, 1986; Hawthorne and Tomlinson, 1999).

A recent study of 200 British Pakistanis found a gradient in knowledge of diabetes, with women and illiterate patients having lower knowledge levels and poorer glycaemic control, as measured by haemoglobin A1c levels (HbA1c) (Hawthorne and Tomlinson, 1999). This dataset showed that Pakistani patients given culturally appropriate health education improved their knowledge of diabetes significantly, including their ability to 'problem solve' in day-to-day situations, compared with a control group (Hawthorne and Tomlinson, 1997). However, their overall glycaemic control did not appear to improve. The education programme for this study was devised to be especially acceptable to the Pakistani community, and to fit with cultural, literacy and language constraints (such as women not being able to mix with men in small group teaching, one-third of the patients being unable to read in any language and many people being unable to understand English). The education intervention was based on topics derived from focus group discussions with patients and staff working in diabetes clinics. These discussions

found that patients were most likely to want health education on diet, but in fact knew little about glucose monitoring, how to control blood sugar, diabetic complications, and the purpose of regular screening to pick up and treat early complications. Pictorial flashcards were designed around these topics using Pakistani subjects, foods and utensils, and these were used by a linkworker trained to deliver semi-structured health education in Urdu or Punjabi in a one-to-one setting (explained further in Methods). The effect of such education on important sections, such as women and illiterate patients within this study sample who are known to have even poorer knowledge of diabetes and glycaemic control, has not so far been reported. This paper reports on a secondary analysis of the effect of gender and literacy on the ability to learn and improve diabetic control from this culturally specific health education programme.

Methods

The methodology and results of a randomized controlled trial of a structured health education programme for British Pakistanis with type 2 diabetes mellitus using pictorial flashcards in a one-to-one interview have been fully described elsewhere (Hawthorne and Tomlinson, 1997). The study was approved by the Ethical Committee of the Central Manchester Health Authority.

The four topics for diabetes health education chosen following the focus group discussions described in the Introduction above were: an appropriate diabetic diet, the value of glucose monitoring (and how to act on the results), diabetic complications (and how to limit their onset and progression), and services offered by the diabetic clinic (e.g. diabetes specialist nurse, retinal screening and chiropody). Teaching objectives for each topic were developed, and interview questionnaires and pictorial flashcards designed around them. Ten colour photographs were produced with the help of a dietician, linkworker and professional photographer, enlarged to A3 size, and laminated. Each was designed to cover one or more of the teaching objectives. The interview questionnaire and flash-

cards were validated by testing them out on patients and staff at diabetes clinics in Nottingham and Manchester, and the results were compared with those from a similar questionnaire used in a study some years previously in Nottingham (Hawthorne, 1990). A linkworker fluent in Urdu and Punjabi was appointed to deliver the health education, and she received intensive in-house training at the Manchester Diabetes Centre from the doctors, specialist nurses, chiropodists and dieticians working there. She obtained a phlebotomy certificate and was closely supervised throughout the study, with additional training in communication skills and interview techniques. The person chosen was a married woman from the community with a background in teaching and religious studies. She had no prior experience of medicine or nursing, but her father in Pakistan had diabetes. Questionnaires were translated during the interview, tailored to the individual patient's understanding, as there was a wide variation in educational level in the study sample. The main study design included a sample size calculation that concluded that the control and intervention groups would each need 100 patients entered in order to be able to show a difference in HbA1c blood tests of 1% between the groups at 6 months (a clinically important difference in glycaemic control).

After giving informed consent, patients were allocated to control or intervention groups as they presented at clinics at the Manchester Diabetes Centre or diabetes mini-clinics at 10 surrounding GPs, using random number tables and presealed envelopes. All patients answered a baseline questionnaire to assess their starting levels of knowledge and self-caring abilities, and had blood taken to measure their glycaemic control (HbA1c levels). The intervention group then underwent the structured health education with the linkworker and discussed the flashcards with her to illustrate the points she was making. They were taught how to check their urine for sugar, if they did not already do it. At 6 months, both control subjects and intervention patients were retested and the blood samples were repeated.

HbA1c was measured using the BioRad Diamat

(high-performance liquid chromatography) method (normal reference range for this laboratory 4–7.5%). SPSS for Windows was used to analyse data (SPSS, Chicago, IL). Outcomes were measured in terms of changes in knowledge scores of questions from the interview questionnaire on diet, diabetic complications and reasons for the management of diabetes, comparing men and women in the intervention and control groups over the 6-month study period ($n = 200$) and also for literate and illiterate women in both groups ($n = 105$). Changes in glycaemic control were calculated by measuring changes in HbA1c levels (post-test minus pre-test)—reduction in total HbA1c implying better control. There were only eight illiterate men in the total study sample, so literacy comparisons were restricted to women only, especially since this appears to be representative of the community as a whole. Prior to performing regression analyses on the data, several new composite variables were computed from the data to help with distinguishing women who had received education from those who had not and illiterate patients of either sex who had had education from those who had not. Linear regression analysis on the total sample was performed to evaluate the relationship between changes in glycaemic control over the study period with health education, gender, literacy levels, recorded diabetic complications and prior knowledge of diabetes. Logistic regression analysis was used to look more closely at the relationships between health education, changes in knowledge over the study period, gender and literacy.

Results

One hundred and five of the 200 people entered into the study were women, 46 in the control group and 59 in the intervention group (Table I). Glycaemic control of women as a whole entering the study was poorer than that of men, with an average HbA1c of 8.8% compared with 8.1% (unpaired t -test = -2.05 , d.f. 192, $P = 0.04$). This is an important difference clinically as well as statistically. Women were, on average, about 3 years younger than the men in the sample (51.5

Table 1. Knowledge assessment scores for men and women before and after health education

	Control group at start		Control group at 6 months		Intervention group at start		Intervention group at 6 months	
	Men (44)	Women (46)	Men (42)	Women (46)	Men (50)	Women (59)	Men (47)	Women (57)
Number of illiterate patients	1	20			7	24		
1. Food knowledge scores (SE)	74% (1.6)	72% (1.4)	77% (1.5)	76% (1.3)	72% (1.6)	71% (1.3)	83% (2.0)	85% (1.1)
2. Knowledge of complications								
(a) eye problems	18 (43%)	16 (35%)	17 (40%)	18 (39%)	17 (36%)	13 (23%)	43 (91%)	49 (86%)
(b) heart	23 (55%)	15 (33%)	22 (52%)	14 (30%)	22 (47%)	16 (28%)	37 (79%)	47 (82%)
(c) feet	5 (12%)	6 (13%)	9 (21%)	14 (30%)	12 (25%)	4 (7%)	34 (72%)	42 (74%)
3. Know of chiropody	11 (26%)	4 (9%)	15 (36%)	2 (4%)	6 (13%)	4 (7%)	26 (55%)	22 (39%)
4. Can manage hyperglycaemia	15 (36%)	7 (15%)	19 (45%)	13 (28%)	13 (28%)	11 (19%)	45 (96%)	47 (82%)
5. Know why to control sugars	9 (21%)	4 (9%)	10 (24%)	4 (9%)	11 (23%)	8 (14%)	39 (83%)	43 (75%)
6. Know purpose of annual reviews	5 (12%)	5 (11%)	11 (26%)	2 (4%)	6 (13%)	8 (14%)	37 (79%)	27 (47%)
7. Regular glucose checks	33 (79%)	27 (59%)	21 (50%)	27 (59%)	28 (60%)	21 (37%)	41 (87%)	44 (77%)
8. Keep glucose records	4 (10%)	5 (11%)	1 (2%)	1 (4%)	4 (9%)	2 (4%)	21 (45%)	18 (32%)
9. Average HbA1c (SE)	8.2% (0.3)	8.8% (0.3)	8.6% (0.3)	8.7% (0.3)	8.0% (0.3)	8.9% (0.3)	8.2% (0.3)	8.3% (0.3)

versus 54.8 years), were less likely to be able to speak English (11 versus 59, $P < 0.01$) and were less likely to be literate (58 versus 91%, $P < 0.01$). There were no important differences in terms of demographic characteristics, glycaemic control or knowledge of diabetes between the intervention and control groups at entry to the study. One hundred and ninety-two people returned for follow-up. Two patients had died from ischaemic heart disease and tuberculosis, four had returned to the Indian subcontinent, and two could not be traced. Five patients refused to take part in the study, saying either that they were too busy or that they did not need further health education about diabetes.

Men and women in the control group changed little in terms of knowledge outcome measures over the 6-month study period (Table I), with women continuing to have lower scores than men in many of the knowledge-based outcome measures. Patients in the intervention group showed improvements in a number of scores, such as improved knowledge of diabetic complications. Men and women in this group achieved the same (higher) scores for most of the diabetes knowledge outcome measures at 6 months, even though women started off with lower scores than men (see Table I). However, women still lagged behind the men in some abstract reasoning, e.g. 37 out of 52 men (79%) said they came to annual reviews to pick up complications early, compared with 27 out of 57 women (47%) ($P < 0.001$, $\chi^2 = 11.7$, d.f. = 1).

Non-readers were more likely to be female, older and Punjabi speaking, with little or no understanding of English and little experience of formal education (Table II). Table III illustrates changes in knowledge scores in literate and illiterate women after 6 months in both intervention and control groups, showing that while scores rose for both literate and illiterate women following education, illiterate women did not fare as well. For example, the scores for reasons for glucose monitoring and how to manage high readings did not catch up in the illiterate group [18 (75%) of illiterate women in the intervention group at 6 months knew what to do if blood or urine sugars were high compared with 29 (88%) of literate

women, $P = 0.02$, two-tail Fisher's test]. Similar results were obtained for knowledge of diabetic complications: 31 (94%) of literate women could name the eye complications of diabetes compared with 18 (75%) of illiterate women 6 months after health education and 29 (88%) literate women versus 18 (75%) illiterate women knew about cardiac complications. Long-term planning, such as the rationale behind yearly screening reviews, also seemed to have been better understood by the literate group. Reported self-monitoring of urine rose in both groups after health education, but there was still a difference, with the literate group reporting more monitoring.

Linear regression analysis (stepwise) of glycaemic control in the whole sample, using changes in HbA1c levels over the 6-month period as the dependent variable, resulted in two entries into the equation at the 0.05 level: (1) HbA1c levels at entry to the study ($B = -0.37$, 95% CI for B -0.48 to -0.25, $P < 0.01$) and (2) the computed variable of 'women receiving health education' ($B = -0.58$, 95% CI for B -1.11 to -0.04, $P = 0.03$). The negative B values show that people with higher HbA1c levels at entry to the study were more likely to lower their HbA1c over the study period and also that the subgroup of women receiving health education were more likely to lower their HbA1c over the study period (indicating an improvement in blood sugar control). Other variables such as gender alone, literacy, recorded diabetic complications and health education of the whole intervention group or combinations of these were rejected. Logistic regression analysis (stepwise, all cases entered) using the same computed variable of 'women receiving health education' as the dependent variable found that changes in knowledge about diabetes as well as changes in glycaemic control over the 6 months are accepted into a model that also includes literacy (Table IVa). Therefore there is a relationship with this subgroup and literacy, as well as with improvements in knowledge and glycaemic control over the 6 months. Because this is a secondary analysis, greater emphasis should be put on significance values $P < 0.01$, but readers may get some

Table II. Comparisons between literate and illiterate patients entering the study

	Literate (n = 149)	Illiterate (n = 52)	P
1. Mean age (years)	52	57	$P < 0.01$
2. Sex M:F	85:60	9:45	$P < 0.01$
3. Duration of diabetes (years)	7	6	
4. Fluency in English (%)	43	6	$P < 0.01$
5. Years of schooling (years)	9	1	$P < 0.01$
6. Preferred language	Urdu 42% Punjabi 36% English 6%	Urdu 2% Punjabi 91%	$P = 0.01$

Table III. Knowledge assessment scores for literate and illiterate women 6 months after health education (data missing four women)

	Control group at 6 months		Intervention group at 6 months	
	Literate (26)	Illiterate (20)	Literate (33)	Illiterate (24)
1. Food knowledge scores (SE)	74% (2.0)	77% (1.5)	86% (1.4)	83% (1.6)
2. Knowledge of complications				
(a) eye problems	9 (35%)	9 (45%)	31 (94%)	18 (75%)
(b) heart	9 (35%)	5 (25%)	29 (88%)	18 (75%)
(c) feet	8 (33%)	6 (30%)	24 (73%)	18 (75%)
3. Know of chiropody	2 (8%)	0	16 (50%)	6 (25%)
4. Can manage hyperglycaemia	9 (35%)	4 (20%)	29 (88%)	18 (75%)
5. Know why to control sugars	3 (11%)	1 (5%)	27 (82%)	16 (67%)
6. Know reason for annual checks	2 (8%)	0	17 (52%)	10 (42%)
7. Regular glucose checks	17 (65%)	10 (50%)	28 (85%)	16 (67%)
8. Average HbA1c (SE)	8.4%(0.3)	9.0%(0.6)	7.7%(0.3)	9.2%(0.5)

indication of importance of the other variables from values $P < 0.05$. A second logistic regression analysis of women in the sample used another computed variable, that of 'illiterate women receiving health education', as the dependent variable (women only entered, Table IVb) to look at the effect of literacy on health education outcomes (men were excluded because there were so few in our sample). This found that only one variable was accepted, i.e. changes in knowledge about diabetic foot complications. It indicates that this subgroup did not appear to change much despite apparently appropriate health education in their mother tongue.

Discussion

Pakistani women with diabetes in this sample, despite knowing less about it initially, can improve

their knowledge levels with health education such that the degree of change surpasses that of men to equal them 6 months later. In addition, glycaemic control improved in women receiving the intervention. This is an important finding in the light of recent work identifying the significance of keeping blood sugar tightly controlled in the prevention or progression of existing diabetic complications (DCCT Research Group, 1993; UK Prospective Diabetes Study, 1998). Illiterate women showed more moderate improvements in knowledge with health education and did not show a corresponding improvement in glycaemic control. This suggests that illiteracy and lack of educational experiences poses a greater challenge to effective health education. However, this is a secondary analysis of data initially collected for a wider assessment of Pakistani patients with diabetes and the numbers

Table IV.

Variables entered	<i>B</i>	SE	<i>P</i>	Odds ratio (OR)	CI for OR
<i>(a) Logistic regression results of 'women receiving health education' (entered stepwise)^a</i>					
Variables accepted:					
Literacy	1.0	0.44	0.02	2.8	1.2–6.6
Change in HbA1c	–0.36	0.12	<0.01	0.7 ^c	0.55–0.9
Change in knowledge of					
1. Eye complications	0.84	0.36	0.02	2.3	1.2–4.6
2. Cardiac complications	0.85	0.33	0.01	2.3	1.2–4.5
3. Foot complications	1.3	0.41	<0.01	3.5	1.5–7.9
4. Ability to manage high sugars	0.68	0.35	0.05	2.0	1.0–3.9
Variables rejected					
5. Importance of normoglycaemia			0.09		
6. Dietary knowledge			0.4		
<i>(b) Logistic regression results of 'illiterate women receiving health education'^b</i>					
Variables accepted					
Change in knowledge of					
1. Foot complications	1.5	0.56	<0.01	4.45	(1.5–13.2)
Variables rejected					
2. Eye complications			0.23		
3. Cardiac complications			0.16		
4. Dietary knowledge			0.21		
5. Ability to manage high sugars			0.1		
6. Importance of normoglycaemia			0.3		
7. Change in HbA1c			0.9		

^aAll cases in study entered (23 cases rejected because of missing data; 179 cases included).

^bEntered stepwise, women only entered (11 cases rejected because of missing data, 96 cases included).

^cOR for a unit change in HbA1c is 0.71

of illiterate women in this sample may not have been powerful enough to demonstrate differences if they had been there. Further research is now needed to look at the specific problems illiterate women from ethnic minority communities face when gathering health information.

None of the possible confounding factors that might influence outcomes of this education, such as concomitant health education elsewhere, changes to medication and prolonged absences in the Indian subcontinent, were significantly associated with changes in knowledge or glycaemic control (the methodology of this study did not include identifying hyperglycaemia and altering medication accordingly). The greatest bias in the data is likely to come from the study's financial constraint of using the same linkworker to collect data as gave the health education initially. This may result in an overestimate of improvement in

knowledge following health education, although the study method tried to prevent this by monitoring every 20th interview with patients.

The education method used tried to bypass perceived barriers to health information gathering, but there is clearly room for improvement, perhaps by using a more frequent method of education, reinforcing information over a longer period of time and leaving reminders such as posters of the flashcards or audiotapes. Participants in the intervention group frequently asked if they could take the dietary flashcards home to be a reminder to them when they went shopping. Patients may need more positive advocacy to encourage them to attend chiropody, retinal screening and annual review clinics. The poorer glycaemic control seen in the female section of the study sample and their poorer knowledge of diabetes may be a reflection of the difficulty they have in getting diabetes

information they can understand that would normally be easily available to other patients, as well as knowing how to use it to their best advantage. Although it is a broad generalization, women in this community tend not to go out alone and are less likely to be able to handle written information. Amongst first generation Pakistani immigrants to this country it is quite usual to find women who have never been to school and who cannot read (Hawthorne, 1990). Bansal (Bansal, 1999) quotes a figure of 73% illiteracy in rural Indian women. There the impact of education in shaping attitudes to health and health seeking behaviour is well documented. The women in our sample, in their late 40s and early 50s are unlikely to become literate now, so health educators must look for innovative new methods that will reach them. In particular, patients may need to learn the techniques of concentration, learning and prioritization first, before being able to benefit from a health education programme. Appropriate methods may be quite different from those traditionally used in this country for diabetes health education, and will need to be tailored to suit the requirements of different communities in terms of their restrictions on male/female interaction, travel outside the home, linguistic and religious needs, as well as their cultural health beliefs.

There continue to be problems communicating with patients from ethnic minority groups in Britain, especially if there are marked language and cultural differences from the general population. Ethnic minority health issues still do not generally feature as part of mainstream health planning and tend to be funded as short-term projects, with poor communication between schemes so that people do not get the opportunity to learn from each other. There is little literature about health education research for ethnic minority communities in Britain, but the American literature on diabetes health education for Mexican and Indian Americans is extensive and fascinating (Russell and Judkins, 1978; Hall, 1987; Jackson and Broussard, 1987). It shows the importance of cultural assessment prior to instituting health education programmes [e.g. serious mismatches

between reading skills and health education materials have been reported (Hosey *et al.*, 1990), and the development of innovative and culturally acceptable health education methods along the lines of Canadian Indian storytelling traditions have been described (Hagey, 1984)]. We also have much to learn from health education techniques currently being used in the Third World, such as raising awareness of diabetes in the community, diabetes education camps (Viswanathan, 1986) and the use of trained community members to give simple health education advice to their peers.

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