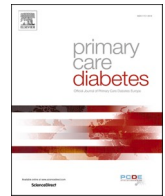




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Implementation of a diabetes prevention programme in a multi-ethnic community in primary care in England: An evaluation using constructs from the RE-AIM Framework

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ABSTRACT

Aims: To implement a diabetes prevention programme in primary care

Methods: The programme was implemented for 12 months in two neighbouring towns, served by eight general practices. Practices requested a referral pathway involving an external administrator running electronic searches and sending postal invitations. If interested, people called and booked a place on the programme. Practices were also provided with resources to refer people directly. Six Educators were trained to deliver the programme. The RE-AIM constructs “Adoption”, “Reach” and “Uptake” were assessed.

Results: All practices engaged in the searches and postal invitations. Overall, 3.9 % of those aged ≥ 25 years had an HbA1c level indicative of non-diabetic hyperglycaemia (NDH) and were invited. Overall uptake (attended as percentage of invited) was 16 % (practice range 10.5–26.6 %) and was highest in two practices where the invitation was followed by a telephone call. Four people were referred directly by their practice. Groups at risk of being excluded were the Bengali population and those unable to attend because of issues such as health, mobility and frailty.

Conclusions: Comprehensive electronic searches meant everyone previously diagnosed with NDH was invited to attend. Follow-up telephone call improved uptake and providing practices with resources to make these calls themselves would likely increase uptake further.

1. Introduction

People with prediabetes are at increased risk of developing type 2 diabetes (T2DM). A study in adults in the UK showed an estimated conversion rate of 7 % in the first year [1] and it is estimated that 11 % of individuals with obesity and non-diabetic hyperglycaemia (NDH) will

progress to T2DM annually [2]. Prevalence estimates of prediabetes vary according to the diagnostic criteria used, the choice of test and the populations studied. The global prevalence of prediabetes based on impaired glucose tolerance was estimated at 10.6 % of the adult population in 2021 [3].

Research has shown that lifestyle interventions can be an efficacious,

Abbreviations: DPP, Diabetes Prevention Programme; T2DM, Type 2 diabetes; BAME, Black Asian and minority ethnic; NDH, Non-diabetic hyperglycaemia; NICE, National Institute for Health and Care Excellence.

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safe and cost-effective way to reduce the risk of progression to T2DM in those diagnosed with prediabetes [4]. High quality efficacy prevention trials have shown that intensive lifestyle interventions reduce incidence of T2DM by up to 50 % in people with impaired glucose regulation [5] and research has demonstrated that interventions implemented within routine clinical settings can lead to weight loss. In order to identify those at risk of prediabetes and offer effective preventative treatments, diabetes screening and prevention programmes have been developed and implemented globally [6–8]. In 2014, NHS England set out its ambition to implement a national Type 2 diabetes prevention programme [9], and in a joint commitment with Public Health England and Diabetes UK, rolled out 'Healthier You': The NHS Diabetes Prevention Programme (NHS DPP) in 2016.

The prevalence of T2DM is much higher in ethnic minority groups (three to five times the White European population) and they are more likely to be diagnosed at a younger age [10]. Access to education programmes is often lower in these groups [11] and barriers to uptake include communication issues and language differences, migrant status, low socioeconomic status and relatively higher levels of social deprivation [12]. In addition, self-management programmes are usually developed for the majority white European population and therefore do not cater for the cultural and language requirements of ethnic minority groups.

The objective of the present study was to evaluate the implementation of a diabetes prevention programme in a primary care setting with a multi-ethnic population. The 12 months implementation period (June 2015 to May 2016) was before the launch of the NHS DPP, so there was no overlap between programmes.

2. Methods

2.1. Study setting

The implementation was carried out in a single locality in England comprising six general practices in the town of Loughborough and two practices in the smaller neighbouring town of Shepshed. The practice serving Loughborough University was not included as their patient list was almost exclusively undergraduate and postgraduate students. The Black, Asian and Minority Ethnic (BAME) population in Loughborough

(19.6 %) is similar to that of England as a whole and is fairly evenly distributed across the six practices in the town (Table 1). Shepshed has a much lower BAME population (2.5 %) [13].

2.2. Choice of prevention programme

The programme implemented was the *Let's Prevent Diabetes* programme which was originally delivered as a six-hour session with annual booster sessions to groups of 8–10 people and was evaluated in a cluster randomised controlled trial [14]. Although the trial showed a non-significant reduction in T2DM at three years, the programme was cost-effective and there were modest benefits in biomedical, lifestyle and psychosocial outcomes [15]. Secondary analysis showed that people who had attended the initial session and at least one booster session had substantial reductions in incidence of T2DM compared to standard care [16].

Before the current implementation started, the programme was reviewed by diabetes specialist nurses to ensure the content was up-to-date and in line with current guidelines. Patient and Public Involvement work was carried out to ensure it was suitable for minority groups in the area (mainly south Asians and a growing population of Eastern Europeans). This included discussing and revising the sections on diet as well as logistical issues such as whether to hold single sex sessions, the need to deliver courses in languages other than English and ways of promoting the programme in the community.

A team of six Educators was trained to deliver the programme. They were practice nurses ($n = 2$) or lay educators with health and exercise facilitation skills ($n = 4$). To accommodate the needs of the local Bengali population, who have particular difficulties with spoken English and with literacy, two interpreters were trained in the ethos and philosophy of the programme and the Educators received training in how to work with interpreters.

2.3. Development of the referral pathway

The implementation had the support of West Leicestershire Clinical Commissioning Group and North Charnwood Federation who were responsible for commissioning and delivering primary care activities in the area. The referral pathway was developed during a half-day

Table 1

Practice demographics and uptake to the programme (where uptake is number attended programme as percentage of number invited).

Practice ^a	List size ^b	Diabetes register ^c		NDH register ^d		Ethnicity profile			IMD ^e	% practice \geq 65 y	NHS Health Check ^f	Uptake N (%)	Method of invitation
		N (%)	%	N	%	WE ^g	SA ^g	Other ^g					
1	12,031	653	7.6 %	347	4.6 %	80 %	15.7 %	4.3 %	5	17.5	100 %	37 (10.7 %)	Single mailing
2	9039	469	6.8 %	250	2.9 %	81.5 %	15.3 %	3.2 %	7	19.6	42 %	62 (24.8 %)	Reminder mailing & phone call
3	8310	489	7.9 %	228	4.2 %	80.6 %	15.2 %	4.2 %	6	18.8	81 %	36 (15.8 %)	Single mailing
4	11,044	686	7.1 %	259	3.1 %	83.9 %	12.9 %	3.2 %	7	17.9	24 %	69 (26.6 %)	Reminder mailing & phone call
5	9524	664	8.6 %	297	4.3 %	79.9 %	15.9 %	4.2 %	6	17.6	76 %	37 (12.5 %)	Reminder mailing
6	6276	520	8.5 %	265	4.8 %	88.9 %	10.3 %	2.8 %	8	16.9	84 %	40 (15.1 %)	Reminder mailing
7	12,982	818	8.6 %	315	3.6 %	97.2 %	1.5 %	1.3 %	8	21.7	104 %	33 (10.5 %)	Single mailing
8	2122	142	7.6 %	102	6.0 %	97.1 %	1.6 %	1.3 %	8	22.4	104 %	23 (22.5 %)	Single mailing

^a Practices 1–6 are in Loughborough and Practices 7 and 8 are in Shepshed

^b Information on total list size provided by practices in June 2016

^c N (%) of patients (aged ≥ 17 years) with Type 1 or Type 2 diabetes. Information provided by practices in June 2016

^d N (%) identified with non-diabetic hyperglycaemia (NDH) and invited to attend programme (≥ 25 y, not diagnosed with Type 1 or Type 2 diabetes, HbA1c value of 42–27 mmol/mol (6.0–6.4 %) in previous 2 years, palliative care excluded). Expressed as percentage of those aged ≥ 25 y

^e Index of Multiple Deprivation of practice address: 1 Lowest decile 10 highest decile of deprivation [32]

^f NHS Health Check referrals - % target in 2014/2015. Data provided by West Leicestershire Clinical Commissioning Group

^g WE White European, SA South Asian [32]

workshop attended by staff from all eight practices in the area (nine general practitioners (GPs), eleven practice nurses (PNs) and two practice managers). Various options for a referral pathway were proposed and discussed: 1) electronic flagging of people with NDH to enable opportunistic referral when they attended the practice, 2) screening by GPs or PNs using the Leicester Diabetes Risk Score [17] followed by referral to the programme and 3) electronic search and mailing of a postal invitation to people previously identified with NDH during a visit for a NHS Health Check.

2.4. Embedding the pathway in the community

The importance of raising community awareness of the programme was also considered, with particular reference to minority groups. Meetings were held with patient groups in two practices in order to seek advice and guidance on how best to promote the programme. Promotional materials were distributed to all practices and various community centres (for example faith centres, leisure centres, social clubs) and the programme was advertised in the local media. The project administrator's role included acting as a 'community champion' for one day a week. This included holding displays at community events where people were invited to complete a diabetes risk score. All promotional material contained a telephone number that people could call if they were interested in self-referring to the programme.

2.5. Evaluation of the implementation

Implementation of the programme was funded by the study budget but delivered by staff employed and managed by North Charnwood Federation. Apart from facilitating the establishment of the referral pathway and training the Educators, the research team were not involved in the implementation. At the end of the 12 month implementation period the authors were provided with process data to enable reporting on a number of constructs based on those in the RE-AIM Framework [18]. These are Adoption (level of engagement by health care providers and factors that impacted on their engagement), Reach (number of people invited or referred to the programme and the degree to which this reflects the number eligible for referral) and Uptake (number of those invited who attended and factors affecting the attendance rate). Follow-up patient level data are not available and therefore it is not possible to report on effectiveness of the programme. However, this has been previously reported for the Let's Prevent programme [15, 16]. A qualitative evaluation was carried out after the implementation period, which involved interviewing people who attended the programme as well as various stakeholders involved in its implementation. This is reported separately [19].

3. Results

3.1. Adoption and engagement by practices

The programme was implemented between June 2015 and May 2016. All eight practices engaged with the programme and information on their demographics is shown in Table 1. This includes whether the practice met their referral target for NHS Health Checks, which is offered to adults aged 40–74 years in England and includes a blood test for HbA1c [20]. Practices were not willing to take a lead role by screening and referring patients and in qualitative interviews they gave resource constraints as the main barrier to implementing a prevention programme [19]. Instead, practices requested a referral pathway in which an administrator employed by the Federation but independent of their practice sent postal invitations on practice headed notepaper to people in their practice identified with NDH. The letter contained a telephone number to call and book a place on a course if interested in attending. The courses were organised, and bookings made by a local administrator employed by the Federation and were delivered in local community

venues. Practices were also given resources to enable them to refer patients directly if they wished.

3.2. Number of people invited or referred (Reach)

READ codes [21] for digitally recording diagnosis of NDH were not available during the implementation period and although all practices maintained registers of patients with NDH, many of these were out of date and inaccurate. Therefore electronic searches were run in all practices to identify people who were aged 25 years and over, had not been diagnosed with Type 1 or Type 2 diabetes, and who met the National Institute for Health and Care Excellence (NICE) [22] and international expert guidelines on the definition of NDH [23], namely an HbA1c value between 42 and 47 mmol/mol (6.0 % and 6.4 %). The search reviewed blood levels in the previous 24 months. The overall prevalence of NDH using this definition in the eight practices was 3.9 %, and there was a twofold variation between practices (Table 1). Four referrals were made by practices and there were no self-referrals in response to the various promotional activities.

3.3. Uptake by people invited

The overall uptake (number attended as percentage of number invited) was 16.3 % and varied between practices (Table 1). The highest uptakes were in Practices 2 and 4 where reminder mailings were sent, as well as follow-up calls made. However, Practice 8, where there was only one mailing of the invitation, also had an attendance rate of over 20 %. The overall 'no show' rate (number not attended as percentage of number booked) was 11 %.

In total 337 people attended 48 courses during the 12-month implementation period, with an average attendance of seven people per course. All courses were delivered on weekdays, despite Saturdays being offered as an option. Interest in attending a single sex course was negligible and none were delivered. Two courses were delivered with an interpreter (13 attendees). In two practices where the postal invitation was followed by a telephone call, reasons for not booking onto a course were obtained from 139 people. These were lack of interest (39.6 %), issues to do with health, frailty, mobility or being a carer (30.9 %), already attended a healthy lifestyle course (12.2 %) or too busy or in full-time employment (7.9 %). The characteristics of the people who attended the courses are shown in Table 2.

Attempts were made to deliver courses supported by interpreters to members of the Bengali population who did not speak English. Invitation letters could not be translated and sent because of potential literacy

Table 2

Characteristics of 337 people who attended the programme (mean (sd) or number (%)). Look at ethnicity profile of whole area.

Age (y)	67.4 (11.2)
Gender (n and % men)	176 (48 %)
Ethnicity (n and %)	
White European	274 (79 %)
South Asian	52 (15 %)
Other	21 (6 %)
HbA1c (mmol/mol)	43.2 (1.23)
HbA1c (%)	6.1 (0.12)
Total cholesterol (mmol/l)	3.78 (1.05)
HDL cholesterol (mmol/l)	1.37 (0.37)
LDL cholesterol (mmol/l)	2.70 (0.85)
Weight (kg)	81.4 (17.3)
BMI	29.5 (5.76)
Overweight (n and %) ^a	121 (36.4 %)
Obese (n and %) ^a	149 (44.9 %)
Systolic blood pressure (mm Hg)	134 (13.3)
Diastolic blood pressure (mm Hg)	77 (10.6)

^a Using BMI thresholds of 23 kg/m² and 27.5 kg/m² for South Asian and other ethnicities [33]

problems, so the proposal was for a member of the practice staff with appropriate language skills to call the people involved. However, despite discussions with relevant practices this did not happen.

4. Discussion

Every practice in the area participated in the implementation and invitations were sent to all patients with an HbA1c level in the previous two years indicative of NDH. Overall, 16 % of those invited attended the programme and this was improved if the postal invitation was followed up with a phone call. The main reasons given by people who did not book to attend were lack of interest and reasons associated with health, frailty, mobility or caring responsibilities.

Although all practices engaged in the implementation, they requested a referral pathway in which they were not directly involved, and which incurred minimal cost to and staff-time allocation from the practice. Despite providing practice staff with resources to refer their patients, only four were referred in this way. An important message from qualitative interviews carried out with practice staff [19] was that more involvement by practices would have been difficult because of “limited time and financial constraints”. A practice manager said “the reason it did work was being able to employ the project co-ordinator to pick up the work on behalf of the practices. So, they weren’t asking practices to do any additional work that took them away from their normal day to day resource” [19].

Comprehensive electronic searches of patient records enabled invitations to be sent to all those without Type 1 or Type 2 diabetes and an HbA1c between 42 and 47 mmol/mol (6.0 % and 6.4 %) in the previous 24 months. The majority of these blood tests will have been done as part of the NHS Health Check which is offered to people in England aged between 40 and 74 years [20]. People who were eligible but missed out on the invitation would be those where NDH had not been identified, because they had not attended their practice for a NHS Health Check. Three practices had achieved the target number of health checks, while in two practices the number was below 50 % of target (Table 1). The overall level of NDH in the eight practices (3.9 % of those aged 25 y and over) was similar to National Diabetes Audit data at the time, that showed there are 1.3 million people in England with ‘recorded NDH’, which is equivalent to 2.7 % of those aged 15 years and over [24]. The lowest prevalence was in Practices 2 and 4, neither of which had reached 50 % of their NHS Health Check target. However, Practices 7 and 8, despite having similar demographic characteristics, and both reaching their referral targets for NHS Health Checks, had different levels of NDH (3.6 % and 6.0 %).

Overall uptake by people invited (number attended as percentage of number invited) was 16.3 %. A telephone call following the postal invitation improved uptake but there was no evidence of a reminder mailing being of benefit. The between practice variation in uptake may be partly due to variations in the demographics of practice populations (although these were not large) but was not due to differences in organisational procedures as these were all conducted by one person working outside the practice and were therefore the same for all practices. Analysis of the NHS DPP [25] showed a 49 % attendance rate at the first session (number attended as percentage of number referred), with a very large cross-site variation (16–86 %). The authors attribute the cross-site variation to a staggered roll-out of the programme, a varied definition of what attendance at the first session means and “differing mechanisms of engagement by referrer of those referred”.

In the NHS DPP, attendance rates were significantly higher in the non-European population [25]. Demographic data are only available on those who attended the programme and therefore it is not possible to look closely at variation in uptake with ethnicity. 21 % of those who attended the present programme were of an ethnic minority background which is similar to that of the area as a whole, suggesting that ethnicity did not significantly affect uptake. The Bengali population in the present study were at particular risk of being excluded as a consequence of

language and literacy issues. Attempts were made to engage with this sub-group, but they were largely unsuccessful. Practices were unwilling to contact them directly and only 13 people (two courses) took up the opportunity to attend a course delivered with an interpreter. Despite holding community events in local venues to raise awareness there were no self-referrals. Alternative methods of engaging with this group, such as screening and delivering education in faith centres, which have been shown to be effective [26], need to be considered. Other groups who missed out on the opportunity of attending the programme were people with health, frailty or mobility issues or those with caring responsibilities (30 % of those where reasons for not attending were available) and an alternative to group education would be needed for them.

Research has shown that direct communication between patient and health care professionals (HCPs) encourages attendance at self-management education programmes [27] and that HCPs need detailed knowledge of the programme in order to encourage their patients to attend [28]. It is likely that uptake would have been higher if GPs and PNs had been more actively involved in the present referral pathway. Findings from qualitative interviews with practice staff [19] showed that some HCPs acknowledged the value of their involvement and that resourcing practices to facilitate referral would have been preferable, to increase patient engagement and awareness of their elevated risk. A practice manager said “I would (...) maybe fund someone within a practice for a small number of hours. I think one of the barriers was that maybe people didn’t quite understand who was contacting them and why and where that fitted in” [19] and a GP said “I think it gives (...) reassurance it is something worth doing and it feels more if it comes from your GP” [19]. Interviews with people who attended often indicated a low prior awareness of their elevated risk and a preference for being referred by a health care professional from their practice, with one person saying “It would probably have been better for the doctor to have told me. I think that would have been better than just getting the letter out of the blue” [19].

The importance of a health care professional in the referral procedure was included in an evaluation of a six-month referral period in one of the sites in the NHS DPP [29]. Of 46 primary care practices involved in referring patients, 16 were visited by a nurse who ran searches of electronic health records and invited patients to group clinics where their referral to the NHS DPP was discussed. Total referral over 6 months was 883, with 774 (88 %) coming from the 16 practices where referral was facilitated by a nurse and 109 (12 %) from the 30 practices where referral was by a member of the practice staff.

The main strength of the study was that the programme was implemented in a routine clinical setting as opposed to a research setting. The results therefore represent what would happen in the real world. Apart from facilitating the choice of referral pathway and training the educators the research team was not involved in the implementation. The primary care organisation that the practices were part of, employed an administrator who managed the implementation from outside the practices. This meant that variations in uptake between practices were not due to differences in organisational procedures. The main weakness was that demographic data are not available on those who did not attend the programme. This meant it was not possible to look closely at variation in uptake according to these characteristics, which would have been of particular interest with regard to ethnic minority groups. Some information on the reasons why people did not attend the programme was collected, but it would have been interesting to collect more.

5. Conclusions

The referral model used during this 12-month implementation period (an external administrator sending out invitations to people already identified with NDH, which required a response from those invited), resulted in a 16 % uptake by those invited. This pragmatic low-cost referral model made use of the comprehensive electronic patient

records available in primary care in England and invited people who had been diagnosed with NDH during an NHS Health Check, without impacting on the workload of practice staff. Additional engagement with certain minority groups at risk of being excluded and provision of culturally appropriate programmes could increase uptake and outcomes further. The growing development of digital self-management programmes for diabetes and other long term health conditions has the potential to increase overall access [30], but care must be taken to ensure all sociodemographic groups are provided for, minimising the possibility of digital inequality and social isolation [31].

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Conflicts of Interest

An adapted version of the Let's Prevent Diabetes intervention is on the framework for the NHS Diabetes Prevention Programme. This work was led by Ingeus (main contractor at the time), with Leicester Diabetes Centre, University Hospitals of Leicester NHS Trust providing training and quality assurance for which funding was received. MJD, KK, TY, and LG were involved in the development of this adapted programme. MJD, KK, and TY were members (KK chair) of the NICE PH 38 (Preventing Type 2 diabetes: risk identification and interventions for individuals at high risk) Programme Development Group. KK is a member of the Expert Reference Group of the NHS Diabetes Prevention Programme. JK and NA were involved in the qualitative evaluation of the programme.

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