RESEARCH ARTICLE

The Jamaican Lay Facilitators Program: a positive impact on glycemic control

Lurline A Less[1], Dalip Ragoobirsingh[1], Errol Y Morrison[†1], Michael S Boyne[1] & Pauline Anderson-Johnson[1]

Summary Points

- The approach to sustainable diabetes education is important to improve diabetes care.
- Lay diabetes education has a positive effect on glycemic control.
- The availability of lay diabetes facilitators is important to fill the gap created by the lack of trained diabetes educators.
- The facilitators are best recruited from among their peers.
- The facilitators need continuing upgrades regarding diabetes education.
- Persons with diabetes must be encouraged to interact regularly with the facilitators.

SUMMARY **Aims**: To improve glycemic control and lower BMI among patients with Type 2 diabetes using lay diabetes facilitators (LDFs). **Methodology:** An intervention study was conducted in 16 health centers (in two rural areas and one urban area) in Jamaica to evaluate the effect of LDFs on glycemia (hemoglobin A1c [HbA1c]) and BMI. In the intervention arm, LDFs were recruited and trained from eight clinical settings and 159 participants were recruited. Another 159 participants from eight comparable clinical settings without LDFs comprised the matched control group. The study was 12 months in duration with HbA1c and BMI measured at 6-monthly intervals. **Results:** Mean HbA1c at baseline for the intervention and comparison groups were 7.94 ± 2.12 and 8.08 ± 1.98%, respectively. After 6 months, the intervention group showed a mean decrease of 8.1% while the comparison group showed an increase of 8.2%. At 12 months, there was further improvement in the HbA1c in the intervention group to 7.08 ± 1.03%, representing an overall reduction of 12.6%, while the comparison group showed even further deterioration in the HbAIc to 8.89 ± 1.69%. There was no statistically significant change in BMI between groups. **Conclusion:** Using the trained LDFs to provide education made a positive difference and showed that effective education can be provided by LDFs. LDFs can also positively assist in sustained quality of care in individuals with diabetes and should be included in the healthcare delivery team.

Diabetes mellitus is associated with high morbidity and mortality rates [1,101]. Long-term complications associated with Type 2 diabetes are adult blindness, renal failure, amputation, stroke and myocardial infarction. The mortality rate in individuals with Type 2 diabetes is two-times higher than in persons without diabetes [2].

[1]Diabetes Association of Jamaica, 1 Dower Avenue, Kingston 5, Jamaica
[†]Author for correspondence: Tel.: +1 876 927 2003; Fax: +1 876 977 6645; errol.morrison@utech.edu.jm

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The International Diabetes Atlas prevalence estimates of diabetes mellitus in 2010 for Jamaica and the North America region were 10.2 and 11.7%, respectively [3]. In 2000, the Caribbean region recorded diabetes as the third leading cause of death. Individuals between the ages of 45 and 64 years were particularly affected [102]. Jamaica reported diabetes as the second leading cause of death [103] and in 2000, estimated the annual total cost of diabetes to be US$409.5 million [4].

Diabetes Self-Management Education (DSME) is the cornerstone of care for all individuals with diabetes who want to achieve successful health-related outcomes. The national standards for DSME are designed to define quality DSME that can be implemented in diverse settings and will facilitate improvement in healthcare outcomes [5].

The Caribbean region does not have diabetes educators as a part of the primary healthcare system. In more privileged settings, they work alongside nutritionists, psychologists, pharmacists, social workers and others to address individual patient's needs. In Jamaica, there has been a thrust to bridge the gap in diabetes education by training lay diabetes facilitators (LDFs) to provide DSME in both group and individual settings. LDFs are mainly community health workers or community volunteers.

According to the US Department of Health and Human Services, community health workers are lay members of communities who work either for pay or as volunteers in association with the local healthcare system in both urban and rural environments. They usually share ethnicity, language, socioeconomic status and life experiences with the community members they serve. They have been identified by many titles such as community health advisors, lay health advocates, 'promoters' outreach educators, community health representatives, peer health promoters and peer health educators. Community health workers offer interpretation and translation services, provide culturally appropriate health education and information, assist people in receiving the care they need and give informal counseling and guidance on health behaviors as well as advocate for individual and community health needs [104].

Lay Diabetes Education Program

In 1997, the Diabetes Association of Jamaica developed a National diabetes educational program, called the 'Lay Diabetes Facilitators' Training Program'. The training was conducted for a duration of 6 h to selected persons from the community, including community health workers. Areas covered during the training included diabetes self-management, the importance of blood glucose monitoring, meal planning, physical activity and foot care.

Participants attaining at least 90% in self-administered pre- and post-tests were certified as LDFs. The LDFs were then empowered to educate others in the community, thereby increasing awareness and knowledge of diabetes and, in particular, improvement in self-management.

As increases in diabetes knowledge in patients can lead to behavior change [6], it was hypothesized that diabetes education provided by LDFs could improve knowledge of other participants, resulting in a reduction in hemoglobin A1c (HbA1c).

The Lay Facilitators' Training Program was conducted in four urban, eight rural and four other town settings.

Intervention

Lay Diabetes Facilitators were retested from the eight intervention health centers using a self-administered standardized diabetes questionnaire. A total of 48% of those from urban/town settings were successful compared with 75% from rural setting. The accepted evaluation score to be successful was at least 90%. The successful 24 LDFs, mainly middle-age females, were recruited to participate in the study. They were retrained via 2 h of diabetes education sessions conducted at baseline, 6 and 9 months by an endocrinologist and a diabetes educator. Training was focused mainly on diabetes education as well as communication with patients, data collection and maintaining confidentiality.

The patients who participated in the study attended the clinics from where the LDFs were employed and were enrolled for diabetes education during the clinic visit.

The education offered by the LDFs was either one-to-one or in a group situation. The group sessions involved 10–12 patients and were conducted at the health centers during regular 3-monthly visits. Group sessions were monitored by the researcher who ensured that the relevant areas of the diabetes curriculum were covered by the LDFs, who usually worked in pairs. Follow-up was carried out between sessions, as often, the LDFs lived in the same

community as the patients. Those unable to attend received the education sessions at home. This continued over the 12-month period. The LDFs were employed by the Ministry of Health as community health workers and this activity was seen as improving the diabetes knowledge of patients, hence, they were not paid to participate in this study.

The LDFs used three patient self-monitoring forms to track individual progress and to prompt key behavior changes. With the Personal Eating Tracker, patients specified the times at which they would eat and then tracked their success in sticking to those schedules. Through a physical activity log, they tracked their success in achieving the goal of 30 min physical activity each day. With a third form, the LDFs kept track of the patients' self blood glucose monitoring and the readings they obtained.

The comparison group continued receiving their 'usual care' from the health centers.

Methodology

An intervention study was conducted to assess changes in glycemic control and BMI in patients who attended eight health centers with LDFs. Participants from 16 health centers were included in the study. A total of 50% were intervention participants, that is health centers from two urban, four rural and two other towns, while 50% comprised the matched comparison group, that is, health centers from two urban, four rural and two other town areas.

A total of 159 participants from the eight intervention health centers with LDFs were needed for statistical significance; all males were included owing to low attendance, while a random sample of women was recruited to attain the desired number. In the matched comparison group, 159 participants from matching health centers, with similar characteristics such as age and gender to those in the intervention group, were selected. Patients in the control group did not interact with the LDFs.

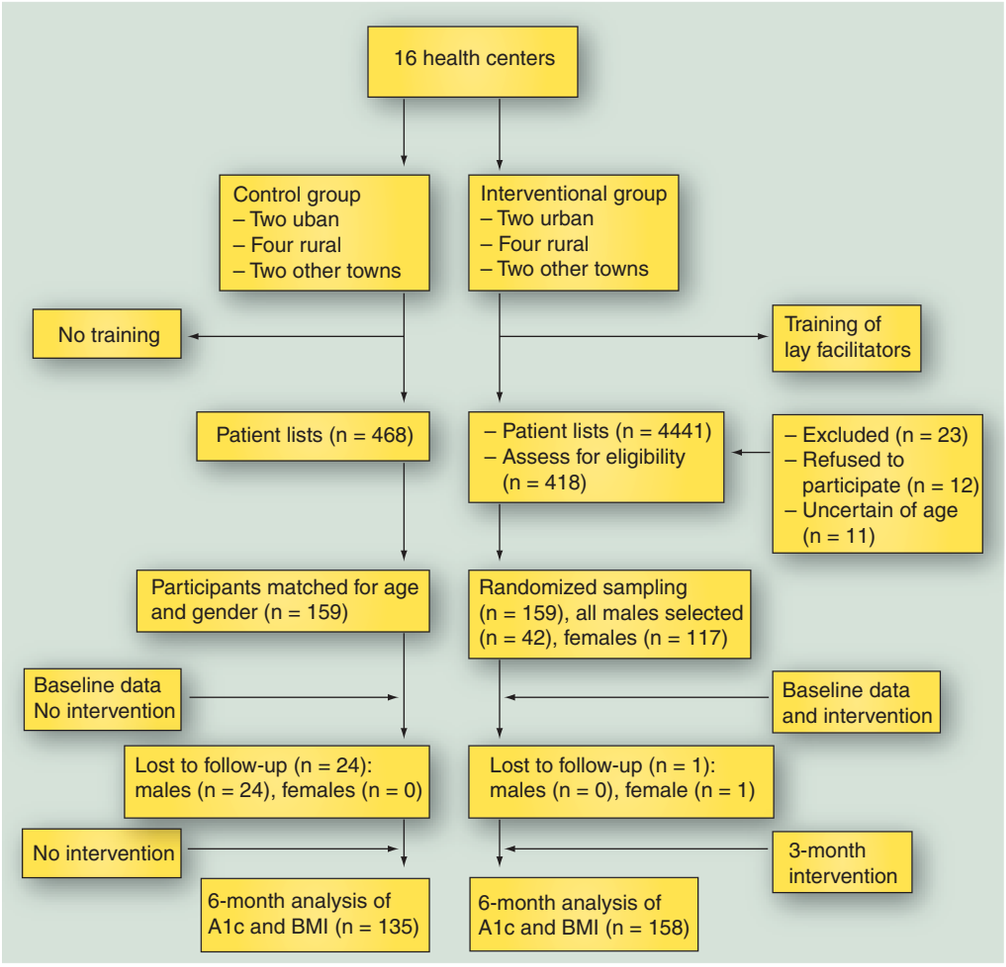

Figure 1. Flowchart showing patient's recruitment and participation.

Target population

Individuals with Type 2 diabetes between the ages of 25 and 75 years who were attending the health centers for their care were included.

Inclusion/exclusion criteria

Adults between the ages of 25 and 75 years with Type 2 diabetes who attended the health center were included in the study. Persons younger than 25 years and older than 75 years, as well as those with gestational diabetes, were not included in the study.

Sample size calculation

A sample size of 319 participants was required to attain a mean change of 0.6% in HbA1c between groups, using a power of 90% to detect this difference (one sided $\alpha = 0.05$) and allowing for an attrition rate of 20%.

Sampling

As shown in **Figure 1**, 441 patients were identified in the eight intervention health centers that had LDFs present. After assessment for eligibility, 418 patients were identified; they were stratified by sex and in age bands (25–44, 45–64 and 65–75 years). All 42 males were included in the study owing to their low attendance rate at the health centers, while 117 women were randomly selected. In the comparison group, participants were matched, as far as possible, in terms of age; however, the matching for age was not perfect. This was evaluated as a possible confounder of intervention. All participants gave informed written consent prior to inclusion in the study.

Data collection tools

The investigator collected baseline demographic data, while trained health technicians conducted measurements of HbA1c and BMI.

The Axis-Shield NyoCard HbA1c Reader (Axis-Shield, Oslo, Norway) was used to conduct the HbA1c measurements. This point-of-care testing device satisfies the National Glycohemoglobin Standardization Program (NGSP) Certification Protocol [7]. Stadiometer-type scales were used to measure weight and height. BMI was calculated as the patient's weight (in kilograms) divided by height (in metres) squared.

Table 1. Baseline characteristics (%) of participants.

Characteristic	Category	Comparison group, n = 159 (%)	Intervention group, n = 159 (%)	p-value
Age in years (mean ± SD)		58.6 ± 13	56.62 ± 11.2	0.05
Sex	Male	25	27	
	Female	75	73	0.40
Area of residence	Urban	30.2	34.6	
	Rural	30.2	30.2	
	Other towns	39.6	35.2	0.64
Education	Primary	76.7	65.4	
	Secondary	23.3	34.6	0.02
Employment	Employed	54.1	58.5	
	Unemployed	45.9	41.5	0.18
Weekly income (US$)	No personal income	17.6	12.6	
	11.1–48.6 (<minimum wage)	50.3	51.6	
	48.6–69.4	20.1	19.5	
	69.5+	11.9	16.4	0.19
Type of diabetes treatment	Insulin only	10.1	14.5	
	Diet and exercise	6.3	2.5	
	Tablets	77.4	78.0	
	Insulin and tablets	6.3	5.0	0.25
Duration of diabetes (years)	<5	34.0	36.5	
	5–10	35.2	41.5	
	11–20	23.3	15.1	
	21+	7.5	6.9	0.24

Analysis

Statistical Package for the Social Sciences version 17 (SPSS® 17; SPSS Inc., Chicago, IL, USA) was used to analyze the data. Student's t-test was used to compare the means, when evaluating the equivalence of the intervention and comparison groups, while the χ^2 test was used to compare proportions. Changes in HbA1c and BMI were primary and secondary outcomes, respectively. To test the relationship between a variety of measures and changes in HbA1c at follow-up, controlling for baseline HbA1c, univariate analyses of variance were performed, using a conservative criterion for the identification of potential confounding variables of significance at a p-value of less than 0.10. The differences between intervention and comparison groups for each of HbA1c and BMI at 6 and 12 months were tested using the univariate analyses of variance, which included clinic site as a random effect, and covarying the corresponding baseline value and variables identified as possible confounders. A two-sided p-value of less than 0.05 was considered statistically significant. Multivariate analyses controlling for different variables were also conducted. Univariate analyses tested the interaction between intervention effects and sex.

Results

Figure 1 illustrates the recruitment and selection of participants in the study. The baseline characteristics of the participants are shown in **Table 1**. There were no significant differences in the percentage of males and females, area of residence, employment, income and duration of diabetes, nor in the type of diabetes treatment used, between the groups. However, the intervention group was younger (p = 0.05) and had received more secondary education (p = 0.02) than the comparison group.

Table 2 shows that both groups had similar mean HbA1c levels at baseline. At 12 months, the intervention group had a reduction in HbA1c of 12.6% (p < 0.001), while the comparison group experienced an increase of 9.0% (p < 0.001).

Table 3 shows univariate analyses of the relationship between several baseline measures and changes in HbA1c at follow-up, controlling for baseline HbA1c. Employed males with higher income showed significantly lower mean HbA1c levels after controlling for baseline HbA1c. In further analysis of the difference between the groups, these variables were entered as covariates.

Table 2. Mean ± SD change In HbA1c between groups at baseline, 6 and 12 months†.

Time period	Groups	n	Mean ± SD	p-value
HbA1c (T0)	Intervention	159	7.94 ± 2.12	
	Comparison	159	8.08 ± 1.98	0.557
HbA1c (T1) 6 months	Intervention	158	7.30 ± 1.75	
	Comparison	135	8.67 ± 1.79	<0.001
HbA1c (T2) 12 months	Intervention	150	7.08 ± 1.53	
	Comparison	135	8.81 ± 1.69	<0.001

†Mean HbA1c was similar in both intervention and control groups at baseline. Among the intervention group, HbA1c decreased by 8.1% at 6 months and by a further 4.5% at 12 months. Conversely, the comparison group showed an increase at both measurement periods with an overall change of 9%. Despite efforts to make contact, the numbers of participants reduced over the time period. After 2 weeks without successful contact and timely testing, persons were removed from the study owing to the time sensitivity of the HbA1c test.
SD: Standard deviation; T0: Time zero (baseline); T1: 6 months later (first follow-up data collection); T2: 12 months later (second and final data collection).

Separate analyses of variance compared the effect of LDFs on HbA1c level at follow-up (controlling for HbA1c at baseline) between the groups, assessing age, sex and employment status to determine the generality of findings across these parameters. There were significant effects of the intervention and age on HbA1c, while the interaction between them was not significant (p = 0.085). The mean HbA1c levels in each age category at follow-up were lower in the intervention group than in the comparison group. Participants 58 years and older had lower HbA1c values than those younger than 58 years of age [8].

In spite of the appreciable loss of 24 men in the comparison sample, out of the 42 who contributed baseline data, neither the main effect of sex nor the interaction with the intervention were significant, showing comparable differences between the intervention and comparison groups for men and women.

The effect of intervention remained highly significant (p < 0.001) when tested for employment status as a moderator; however, neither the main effect of employment status nor the interaction between employment status and intervention were significant. When BMI data were evaluated at 6 and 12 months using univariate analyses, controlling for baseline data and potential confounders, there were no differences associated with the intervention. When multivariate analysis controlling for different variables was carried out, the results were the same.

Discussion

The use of LDFs in the delivery of diabetes education resulted in clinically significant changes in individuals with diabetes in their communities. From as early as 6 months, the positive influence of

Table 3. Variables associated with change (mean) in HbA1c at 6 months post-intervention.

Characteristics	Categories	Mean HbA1c (95% CI)	p-value
Sex	Male	7.52 (7.16–7.88)	
	Female	8.02 (7.84–8.21)	0.015
Employment status	Employed	7.79 (7.57–8.01)	
	Unemployed	8.08 (7.84–8.33)	0.08
Educational status	Primary	8.00 (7.81–8.20)	
	Secondary and tertiary	7.72 (7.42–8.03)	0.13
Type of diabetes treatment	Diet and exercise	8.01 (7.07–8.96)	
	Tablets only	7.97 (7.78–8.15)	
	Insulin only	7.46 (7.00–7.92)	
	Insulin and tablets	8.22 (7.53–8.90)	0.19
Insulin treatment	Insulin	7.69 (7.31–8.08)	
	Noninsulin	7.97 (7.79–8.15)	0.21
Area of residence	Urban	7.71 (7.69–8.26)	
	Rural	7.92 (7.65–8.20)	
	Other towns	7.86 (7.56–8.15)	0.85
Income (US$)	None	8.21 (7.80–8.60)	
	Below minimum wage	7.78 (7.58–8.00)	
	48.6–69.4	8.60 (8.14–9.06)	
	>69.4	7.46 (6.92–8.00)	0.002
Duration of diabetes (years)	≤5	7.90 (7.61–8.18)	
	6–10	7.78 (7.46–8.10)	
	11–20	8.02 (7.64–8.40)	
	>20	7.92 (7.30–8.55)	0.82

the LDFs was already evident and by 12 months, the intervention group showed a decrease in HbA1c of 12.6% when compared with baseline, while the comparison group showed an increase (9.0%) in HbA1c over the same period of time.

Chronic complications of diabetes can be predicted by glycemic control measurements [9]. A meta-analysis conducted by Norris *et al.*provided evidence of the efficacy of DSME for individuals with Type 2 diabetes on HbA1c. Results showed HbA1c improvement with DSME, with an average change of -0.76%, when measured at immediate follow-up [10]. There are important implications for current clinical and public health practice, whereby each 1% reduction in HbA1c over 10 years is associated with a reduction in risk of 21% for any end point related to diabetes, 21% for deaths related to diabetes, 14% for myocardial infarctions and 37% for microvascular complications [11]. Thus, the improvement in HbA1c of 12.6% is of tremendous significance for policy implementation for using this approach in this particular chronic disease, and, by extension, it is a modality worth considering for other chronic conditions.

The effect of lay education was shown to be highly significant relative to the comparison group, even after accounting for a number of possibly confounding variables including age, sex, type of treatment, duration of diabetes, employment status, income status, education and rural versus urban residence. Among these, age, sex, employment status and income status were associated with changes in HbA1c from baseline to follow-up, but none of them accounted for or appreciably diminished the differences between intervention and comparison groups regarding changes from baseline to follow-up. The fact that nonmedically trained persons can participate in the delivery of diabetes education is also extremely important for regions where healthcare teams are in short supply, to serve the educational needs of persons with diabetes. Using the trained LDFs in providing education made a positive difference, and demonstrated that effective education can be provided by trained peer educators.

This project is ongoing and will determine the methodology required to ensure sustainable outcomes in improving the quality of care. The cost–effectiveness of the program was not assessed for this study, but it is our intention to explore this area in the future.

Limitations

Resource persons

Resource persons were the health workers and nonhealth workers who participated in the project by delivering diabetes education and follow-up with the participants. They had 7 years of schooling and were successful in lay diabetes education training. They lived in the community of the intervention:

- Locating successful nonhealth community persons who were previously trained as LDFs was difficult owing to changes in jobs, relocation or loss of contact;
- Community health workers were more responsive to the study than the nonhealth community persons (the health professionals accounted for 75% of the sample size and 25% were nonhealthcare professionals);
- Initially, more females were trained as LDFs than males; therefore, the even distribution of males to females could not be achieved.

Participants

Participants were the eligible persons with diabetes from the selected health centers:

- Low participation of males in the study was due to low clinic attendance, a cultural pattern noted across the health centers visited;
- Approximately 47% of males were lost from the control group at 6 months; overall loss to follow-up was 10%;
- Self-reported data;
- Point-of-care testing of HbA1c compared with laboratory testing may have systemic errors.

Cost–effectiveness

The reduction in HbA1c in the prevention of diabetes-related complications could be used to ascertain the cost–effectiveness of the study. LDFs who participated in the study were community health workers and community persons trained to provide additional service. If improved HbA1c can be sustained over time, this could reduce the occurrence of complications and hospitalizations. This would be of high value to government health systems.

Participants who were educated by LDFs had improved glycemia at the first follow-up at 6 months and this was further improved at 12 months. This could have resulted from improved self-management and a higher level of awareness of the disease.

We are committed to ongoing empowerment of the LDFs to ensure their availability and knowledge base in order to continue to assist in the management of this chronic condition.

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No writing assistance was utilized in the production of this manuscript.

Ethical conduct of research

The authors state that they have obtained appropriate institutional review board approval or have followed the principles outlined in the Declaration of Helsinki for all human or animal experimental investigations. In addition, for investigations involving human subjects, informed consent has been obtained from the participants involved.

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