A Community Health Worker–Led Intervention to Improve Blood Pressure Control in an Immigrant Community With Comorbid Diabetes: Data From Two Randomized, Controlled Trials Conducted in 2011–2019

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Evidence-based strategies addressing comorbid hypertension and diabetes are needed among minority communities. We analyzed the outcome of blood pressure (BP) control using pooled data from two community health worker interventions in New York City conducted between 2011 and 2019, focusing on participants with comorbid hypertension and diabetes. The adjusted odds of controlled BP (< 140/90 mmHg) for the treatment group were significant compared with the control group (odds ratio = 1.4; 95% confidence interval = 1.1, 1.8). The interventions demonstrated clinically meaningful reductions in BP among participants with comorbid hypertension and diabetes. (*Am J Public Health*. 2021;111:1040–1044. https://doi.org/10.2105/AJPH.2021.306216)

Although clinical and lifestyle recommendations are in place to promote hypertension control for individuals with diabetes, there is a gap in the implementation of evidence-based strategies to address comorbidities, particularly among minority communities that may face social and cultural barriers to optimizing chronic disease management. We report on the impact of blood pressure (BP) control among individuals with comorbid hypertension and diabetes in two community health worker (CHW)-led interventions in the South Asian community (Table 1),[1,2] an immigrant population with a high risk of cardiovascular disease.[4]

INTERVENTION

We conducted a secondary analysis of two patient-centered lifestyle interventions utilizing CHWs among South Asians. The DREAM Project enrolled Bangladeshi individuals diagnosed with type 2 diabetes into a culturally adapted diabetes management intervention conducted in community and clinical settings (n = 336).[1] Project IMPACT enrolled South Asian individuals with uncontrolled hypertension into a hypertension management intervention in clinical settings (n = 304).[2] Both studies randomized participants into treatment and control groups after all participants had received the first educational session. Treatment group participants then received four additional group educational sessions led by the CHW (Table 1).[1,2]

PLACE AND TIME

Both studies were conducted in New York City. DREAM was conducted from April 2011 to November 2016, and IMPACT was conducted from February 2017 to May 2019.

PERSON

The analytic sample included the subset of South Asian individuals from the DREAM and IMPACT studies with comorbid

TABLE 1— Overview of Study Characteristics: IMPACT and DREAM Studies, New York City, 2011–2019

	IMPACT	DREAM
Disease focus	**Hypertension**	**Diabetes**
Recruitment setting	Community-based primary care practices (n = 14) in New York City primarily serving South Asians	Safety-net hospitals in New York City (n = 2) and community-based primary care practices (n = 2)
Recruitment process	(1) Identified through EHR and mailed a recruitment letter; (2) tabling and outreach at sites; (3) referral by provider	(Same as for IMPACT)
Eligibility criteria	(1) South Asian ethnicity (defined as self-identified Asian Indian, Bangladeshi, Pakistani, Nepali, Sri Lankan, or of Indo-Caribbean descent); (2) hypertension diagnosis through EHR or uncontrolled BP reading; (3) aged 18–85 years; (4) not pregnant at screening	(1) Self-identified as Bangladeshi; (2) physician diagnosis of type 2 diabetes verified through patient medical record; (3) aged 21–85 years
Randomization	After outreach by CHW, consent and completion of session 1	(Same as for IMPACT)
CHW curriculum: group-based educational sessions	5 monthly, 60-minute, group-based health education sessions delivered in English or South Asian language by a CHW using a culturally adapted curriculum over the 6-month study period (treatment); 1 60-minute group-based health education session delivered in English or South Asian language by a CHW using a culturally adapted curriculum at the start of the study period (control)	(Same as for IMPACT)
CHW curriculum: coaching and goal-setting follow-up	10 biweekly follow-up calls for action-planning and goal-setting to improve hypertension management, conducted by CHWs in participants' preferred language using standardized scripts and documentation forms	2 in-person 1-on-1 visits for action-planning and goal-setting to improve diabetes management, conducted by CHWs in participants' preferred language using standardized documentation tools
CHW training	Core competency-based training, 105 hours[3]	(Same as for IMPACT)
CHW characteristics	3 women and 3 men	2 women and 2 men
Languages used to deliver curriculum	Bengali, Punjabi, Urdu–Hindi, English	Bengali, English
Session location	Community-based primary care practices and community organizations	Safety-net hospitals, community-based primary care practices, and community organizations
In-person data collection	Surveys and BP collected at baseline and months 3 and 6, with both treatment and control groups by CHWs	(Same as for IMPACT)

Note. BP = blood pressure; CHW = community health worker; EHR = electronic health record; PCP = primary care practice.

hypertension and type 2 diabetes who had uncontrolled BP (≥ 140/90 mmHg) at screening: 187 individuals from DREAM and 167 individuals from IMPACT.

PURPOSE

Most CHW interventions address risk factors associated with a single morbidity. However, more than two thirds of US adults with diabetes have hypertension, and half are not meeting BP goals despite antihypertensive treatment.[5] The purpose of this analysis was to ascertain whether individuals with comorbid diabetes and hypertension could benefit from a CHW intervention.

IMPLEMENTATION

For both studies, BP measurements were collected by the CHW; in IMPACT, missing follow-up BP measures were obtained directly from patients' medical records. Diabetes diagnosis was self-reported for IMPACT; for DREAM, it was verified by the patient's electronic medical record.

EVALUATION

We compared demographics among the treatment and control groups at baseline using descriptive statistics; Pearson λ^2 tests and two-tailed Student *t* tests were used to determine statistically significant differences ($P < .05$) between the groups. To test within-group differences, we used two-tailed paired *t* tests and McNemar tests. To assess change across groups for each continuous outcome, we ran generalized estimating equation (GEE) models for repeated

TABLE 2— Changes in Blood Pressure and Proportion With Controlled Blood Pressure at Baseline and 6-Month Follow-Up for Treatment and Control Groups, Overall and Stratified by Study: IMPACT and DREAM Studies, New York City, 2011–2019

	Intervention Group (n = 159), Mean ±SD or No. (%)			Control Group (n = 133), Mean ±SD or No. (%)			Intervention Effect or OR	
	Baseline	6-Month	*P*	Baseline	6-Month	*P*	Unadjusted (95% CI)	Adjusted[a] (95% CI)
SBP (mmHg)								
Overall	135.9 ±18.2	130.2 ±14.8	< .001	137.3 ±17.8	137.3 ±18.6	.98	−6.0 (−10.2, −1.9)	−6.2 (−10.4, −2.1)
DREAM	134.3 ±18.3	126.2 ±16.7	< .001	135.7 ±15.6	129.1 ±15.2	.013	−2.3 (−8.6, 4.0)	−2.5 (−8.8, 3.8)
IMPACT	137.2 ±18.0	133.5 ±12.1	.017	138.7 ±19.5	144.6 ±18.4	.007	−9.4 (−14.5, −4.2)	−9.3 (−14.5, −4.2)
DBP (mmHg)								
Overall	82.7 ±11.3	78.5 ±9.0	< .001	81.3 ±11.6	81.3 ±13.3	.1	−4.0 (−6.3, −1.6)	−4.0 (−6.3, −1.7)
DREAM	80.5 ±11.0	76.1 ±10.1	< .001	76.9 ±10.9	74.4 ±12.4	.08	−1.1 (−4.6, 2.4)	−1.1 (−4.6, 2.4)
IMPACT	84.5 ±11.2	80.5 ±7.4	< .001	85.2 ±10.9	87.4 ±10.9	.06	−6.1 (−9.2, −3.1)	−6.1 (−9.1, −3.1)
BP < 140/90								
Overall	76 (47.8)	114 (71.7)	< .001	67 (50.4)	74 (55.6)	.2	1.4 (1.1, 1.8)	1.4 (1.1, 1.8)
DREAM	42 (58.3)	53 (73.6)	< .001	35 (56.5)	46 (74.2)	.07	1.3 (0.9, 2.0)	1.3 (0.8, 1.9)
IMPACT	34 (39.1)	61 (70.1)	< .001	32 (45.1)	28 (39.4)	> .99	1.5 (1.0, 2.2)	1.5 (1.0, 2.3)

Note. BP = blood pressure; CI = confidence interval; DBP = diastolic blood pressure; OR = odds ratio; SBP = systolic blood pressure.

[a]Adjusted for gender and age.

measures, including study arm, time point, and the interaction between study arm and time point. Adjusted models for this complete case analysis included gender and age. The study arm × time point interaction tests the intervention effect, and the B coefficients computed by GEE represent the change in slope within the two study arms over time. For BP control (< 140/90), we ran GEE models using a binomial distribution to estimate odds ratios. We used SAS version 9.4 (SAS Institute, Cary, NC) for analyses.

This was a secondary analysis of two randomized, controlled trials having more than 80% retention. To assess selection bias, we compared participants having six-month BP measurements with those who did not, but there were no significant differences between these groups. We ran models adjusting for session attendance and using 130 over 80 millimeters Mercury as the cutpoint for BP control,[6,7] but inferences were similar for session attendance and nonsignificant for 130 over 80 millimeters Mercury (data not shown). Our intervention was delivered in both clinical and community settings, further supporting generalizability.

Of the 354 individuals with comorbid hypertension and diabetes, 60.7% were female, and the mean age was 58.5 years (SD = 9.6). All were foreign-born, mean years lived in the United States was 13.7 years (SD = 9.9), and 37.4% spoke English very well or well. Most (89%) were married or living with a partner, and 40.8% had less than a high school education. Most were taking diabetes (89.5%) and hypertension (96.6%) medications. There were no statistically significant differences by randomization group. Compared with IMPACT participants, DREAM participants were significantly more likely to be female and to be married, and had higher education (Table A, available as a supplement to the online version of this article at http://www.ajph.org).

Most (n = 292, 82.5%) had complete BP data at baseline and six-month follow-up. We compared participant characteristics among individuals with complete BP versus no BP data at follow-up, and there were no significant differences by group.

Table 2 presents changes in BP between baseline and six-month follow-up among individuals with complete data. In the treatment group, mean systolic BP and diastolic BP decreased significantly over time. No change in systolic BP and diastolic BP was seen for the control group.

GEE models present the difference in slope both within and between the study groups over time. Greater improvement in systolic BP and diastolic BP was seen in the treatment group compared with the control group; the difference in slopes was −6.2 millimeters Mercury (95% confidence interval

[CI] = −10.4, −2.1) and 4.0 millimeters Mercury (95% CI = −6.3, −1.7), respectively, in adjusted analyses.

BP at six months was controlled among a significantly greater percent of individuals in the treatment group (71.7%) than in the control group (55.6%), when BP control was defined as lower than 140 over 90 millimeters Mercury. The odds ratio of controlled BP from baseline to six months for the treatment group was 1.4 times the odds ratio for the control group in adjusted analysis (95% CI = 1.1, 1.8). When BP control was defined as lower than 130 over 80, comparisons between intervention and control groups were nonsignificant.

We conducted a stratified analysis by DREAM and IMPACT study populations and found that the magnitude of results was greater in the IMPACT population for reductions in systolic BP and diastolic BP, although treatment group participants in both studies experienced reductions (Table 1).

Limitations include that the two studies had some differences by demographic characteristics, and some differences were noted in stratified analyses conducted by study. However, study differences were in magnitude only, indicating that both interventions improved BP control. Our intervention was evaluated in an urban setting, but results from rural settings[8] and lower-income countries[9] suggest that findings may be generalizable.

ADVERSE EFFECTS

We are not aware of any adverse events of this program, but such considerations are critically important for the development and implementation of any new behavioral intervention program.

SUSTAINABILITY

The CHWs delivering both interventions were hired through grant resources. However, both projects employed a community-engaged approach and included partnerships with diverse stakeholders, including community organizations, clinics, and payers, which facilitated the sustainability of the workforce. For example, several project CHWs were subsequently supported by the New York University Langone Community Service Plan to continue providing BP and diabetes education in faith-based settings. In addition, we are pursuing sustainability funding for CHW programs in partnership with a Medicaid payer. Finally, additional funding was acquired, and CHWs are currently engaged in another study.

PUBLIC HEALTH SIGNIFICANCE

Among South Asian immigrants with multiple chronic diseases, this CHW intervention led to clinically meaningful BP reductions[10] compared with the control group. The CHW intervention also improved the proportion of participants with controlled BP, defined as lower than 140 over 90 millimeters Mercury. These findings are consistent with a recent meta-analysis (standardized mean differences for systolic BP and diastolic BP = –0.32 and –0.35, respectively).[9]

We demonstrated that an integrated CHW-led intervention targeting chronic disease reduction among South Asians in New York City can significantly reduce BP in patients with comorbid diabetes and hypertension. Health systems and primary care practices aiming to improve the care of immigrant and minority patients with multiple comorbidities may consider this study as supportive evidence for the addition of trained CHWs. AJPH

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CONTRIBUTORS

J. M. Beasley, L. C. Wyatt, and N. S. Islam drafted the manuscript. J. Zanowiak, C. Trinh-Shevrin, and N. S. Islam conceptualized and conducted the interventions. L. C. Wyatt analyzed the data. All authors edited and approved the manuscript.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

HUMAN PARTICIPANT PROTECTION

These studies were approved by the New York University Institutional Review Board.

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