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Results from brief educational intervention and health screenings: A community health study of Latinos in Southwest Florida

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Abstract:

BACKGROUND: Latinos in the U.S., one of the fastest growing minority population, have low health-related knowledge and higher rates of diabetes and obesity.

AIM: The study aims (1) to assess health-related knowledge levels and change in knowledge levels after brief educational intervention and (2) to assess undiagnosed diabetes, hypertension, and hypercholesterolemia in adult Latinos residing in Immokalee, Florida. A total of 164 participants completed pre–posttests while 161 participants took part in health screenings comprising blood pressure (BP), total cholesterol (TC), blood glucose (BG), and body mass index (BMI).

METHODS: Health-related knowledge levels were assessed using 10 questions before and after the educational intervention via face-to face interviews. BP was measured using automated sphygmomanometer, BG and TC were measured using lipid and glucose analyzer, waist circumference using inch tape and BMI using digital scale. T test and Chi square were used to examine the differences in knowledge levels and distribution of screening results across demographic characteristics and self-reports respectively.

RESULTS: Mean age was 40.1 ± 13.3 years; there were 77 males and 87 females. The knowledge levels based on 10 questions increased by 1.43 (0.42) after educational sessions ($P < 0.001$). Participants with college degree had statistically significantly higher pre–posttest scores than those with no formal or less than high school education ($P = 0.041$). More males than females had high BP in the age groups of 18–44 and ≥ 45 years ($P < 0.001$). More males in the age group of 18–44 years had high TC ($P = 0.024$). Differences between screening results and self-reports for diabetes and BP were statistically significant ($P < 0.001$ and $P = 0.01$, respectively). Mean BMI was 28.5 ± 5.1 and waist circumference was 38.6 ± 4.8 inch. Mean random and fasting BG levels and TC were higher in females than in males ($P = 0.003$, $P = 0.022$, and $P = 0.004$, respectively).

CONCLUSIONS: The study highlights undiagnosed diabetes and hypertension in Latinos and more Latino males than females to have hypertension and hypercholesterolemia. Latinos' vulnerability to chronic diseases and associated complications is further confounded by limited health knowledge. However, the results of the brief educational program were encouraging and have implications in setting up structured educational interventions in health clinics and migrant education programs.

Keywords:

Community health education, Latinos, screenings

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Introduction

Latinos in the US are the largest ethnic group with projected population

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increased from 17.4% in 2014 to 28.6% by 2060.^[1] They are disproportionately burdened by high rates of obesity, hypertension, and diabetes.^[2-5] In addition to the issue of high prevalence of chronic

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conditions in Latinos, high uninsured rates and cost concerns delay Latinos to seek medical care or not seek healthcare at all.^[6] They use fewer health screenings. Diagnosis of diabetes or cardiovascular diseases occurs later in course of the conditions, resulting in more complications.^[7] Higher percent of Latinos with diabetes or prediabetes remain undiagnosed.^[8,9] Latinos are also less likely to have a blood pressure (BP) or cholesterol screenings than Whites or Blacks, making health screenings crucial in this group.^[6,10]

A lack of awareness regarding prevention and recognition of signs and symptoms of chronic diseases further increases their risk to diseases and prevents them from seeking care. Studies have pointed out to deficiencies in diabetes knowledge among Latinos: factors such as socioeconomic status and acculturation affecting their understanding of health-related concepts.^[11] More acculturated Latino/as and Latino/as with high socioeconomic profiles have more health-related knowledge and have utilized preventive services.^[12-14] Health education aims to improve knowledge of health risks, health services, and compliance with prescribed actions and to increase participation in health programs.^[15]

Studies have shown health education to be associated with increased health literacy and willingness to accept and engage in health screenings. Health screenings and awareness of medical conditions are also documented to be a motivating factor for the acquisition of more health-related knowledge when people ask questions and are eager to learn.^[16] Studies show nutrition knowledge to be greater among those with diabetes and those who had seen a diabetes educator or dietician.^[7,17] Health education informs health participation and vice versa.

The study assesses two different but inter-related concepts: health-related knowledge levels and prevalence of obesity, diagnosed and undiagnosed diabetes, hypercholesterolemia, and hypertension by age and gender groups among adult Latinos in Immokalee, Florida. Immokalee is a federally designated health professional shortage area, with a paucity of health data among Latinos. One of the recent studies conducted among Latinos in Immokalee showed the need for more health provisions including better access to and affordability of healthcare. In addition, the study noted low educational level, especially among foreign-born Latinos, implying low health-related knowledge levels.^[18] Some health education accompanies while seeking professional healthcare but that is limited to only those who seek health services. Since Latinos have less utilization of healthcare services, health education becomes even more indispensable in disadvantaged communities such as Immokalee.^[19] Brief educational interventions reduce participants' burden

in terms of time and commitment, while disseminating important and relevant health information is required to achieve significant and sustainable impact on health behaviors.^[20,21] Studies have pointed out to the effectiveness of brief tailored education in reducing alcohol intake and improving nutrition outcomes.^[22,23]

Several studies looked at knowledge level among Latinos on gamut of health-related topics such as oral health, ocular health, diabetes risk, and cancer.^[24-28] However, educational interventions to improve knowledge levels were limited and only included patients already seeking healthcare and lacked diversity in sample characteristics.^[29-31]

Therefore, this community study had two main objectives:

1. To assess the health-related knowledge levels and changes in knowledge levels after participating in brief educational sessions of the Latinos by age, gender, educational levels, and self-reported health conditions. The goal was to evaluate the effectiveness of brief educational sessions on health-related knowledge levels
2. To examine diabetes, hypertension, hypercholesterolemia, and body mass index (BMI) levels by age and gender groups and the difference between self-reports and screening results.

Methods

Research design and procedure

The cross-sectional study comprising health education and screening sessions was conducted at three different locations in Immokalee during August–October 2018. The study was approved by the institutional review committee at a higher educational institution in Florida (2018-40). Five trained bilingual research assistants, mostly from Immokalee, conducted the health education sessions while two physician assistants conducted and recorded the clinical findings. Assessment of knowledge levels related to health topics on nutrition, staying healthy, chronic diseases, and emergency (hurricane preparedness) was done before and after the health education sessions using materials from the Florida Literacy Coalition. There were six health education events alternating topics from nutrition/staying healthy to chronic diseases/hurricane preparedness. The health topics covered were topics relevant to the community as found in one of the preliminary studies by the authors.^[18] In addition, Southwest Florida was hard hit by hurricane Irma in 2017. The hurricane affected immediate healthcare access and increased risks to chronic stress in the community prompting inclusion of emergency preparedness topic in the educational sessions. Each educational event was 30-min long snapshot of topics

using audiovisual materials presented in a PowerPoint format followed by questions and group discussions in either Spanish or English. Interested Latinos often walked up to the health screenings, and if they were further interested to know about the prevention and management of diseases chose to sit for the educational sessions. Latinos often came with their family members including minors. Although child care and food were provided, their time to listen and pay attention was limited given the circumstances.

Participants

Participation in the study was both anonymous and voluntary. Expressing interest verbally and signing written consent form (one for health education and the other for health screenings) allowed them to participate in both. Alternatively, they could choose to participate in either screening or health education. Latinos aged 18 years and above residing in Immokalee were eligible for participation in the study. Approximately 200 Immokalee residents were approached of which nearly 30 declined to participate, three were found ineligible, and three did not sit through the educational session. A total of 164 pre-posttests were completed in the health education events; 85 of the 164 attended emergency preparedness/chronic diseases presentation while 79 attended nutrition/staying healthy. Of 161 participants who took part in health screenings, we had missing values on blood glucose (BG) and cholesterol for 19 participants due to errors in clinical readings. The analyses included cases that had nearly all information on clinical and nonclinical variables. A majority of participants who took part in health screenings also participated in health education sessions.

Measures

Demographics

Information was collected on demographics such as age, gender, and educational levels. Age was treated as a categorical variable with the age groups of 18–44 years and ≥ 45 years.

Nonclinical measures

For the assessments of the knowledge levels, participants had to answer 10 multiple-choice questions covering that day's topic before presentation. After attending a 30-min presentation, they answered the same set of questions to determine change in their knowledge levels. Questions included listing salt content by looking at a food label, identifying food high in carbohydrates, identifying risk factor for diabetes, identifying signs and symptoms of asthma, difference between a heart attack and stroke and listing safe spot to hide in homes during hurricanes, identifying reliable news sources for hurricane updates to list a few. Correct responses were given a value of one while incorrect responses were given a value of zero. The

pre- or post-knowledge levels were the sum of the total number of correct responses.

For the health screenings, participants were asked to list existing conditions they were aware of and when was the last time they ate. If females, they had to note whether or not they were pregnant.

Clinical measures

Health screenings comprised measuring BP using automated sphygmomanometer; BG and total blood cholesterol (TC) were measured using lipid and glucose analyzer; waist circumference was measured using an inch tape; and body mass index was measured using a digital scale.

BG level was treated as a categorical variable. For fasting BG readings, levels between 100 and 125 mg/dl were grouped as prediabetes and levels above 126 mg/dl of blood were categorized as diabetes. Fasting BG ≥ 131 mg/dl was considered high. For random BG readings, values between 140 and 199 mg/dl were treated as prediabetes and values 200 mg/dl and above were treated as diabetes (American Diabetes Association [ADA]). Reading greater than 180 mg/dl was considered high for random BG. People were considered to have undiagnosed diabetes if they reported no previous diabetes diagnosis but had fasting BG levels of ≥ 126 mg/dl or random BG levels of ≥ 200 mg/dl.

Systolic BP and diastolic BP were also treated as categorical variables. For systolic pressure, values below 119 were considered normal, 120–139 were considered prehypertension, and 140 or higher considered being hypertension (American Heart Association). For diastolic pressure, values below 79 were considered normal; 80–89 considered elevated; while 90 and above were high. Readings of systolic < 120 mmHg and diastolic < 80 mmHg were grouped as normal BP. Systolic readings between 120 and 129 mmHg and diastolic < 80 mmHg were categorized as elevated BP, while readings for systolic between 130 and 139 mmHg or diastolic between 80 and 89 mmHg were grouped as hypertension (American Heart Association).

BMI levels were also categorized as underweight (lowest - 18.4), normal weight (18.5–24.9), overweight (25–29.9), and obese (30 and higher).^[32]

TC levels were considered to be normal if below 200 mg/dl. Values of 201 mg/dl and higher were considered to be high TC levels (American Heart Association).

Data analyses

Data were entered into SPSS database (IBM Corp., version 24, Armonk, NY, USA). *T*-test was used to

determine the changes in knowledge levels before and after health education program. *T*-test/*F*-statistics were used to detect differences in clinical and biochemical indicators across age groups and gender. Chi-square test was used to determine differences in distribution of self-reported health problems and the corresponding clinical findings.

Results

The baseline and post-intervention knowledge levels of the participants across gender, educational level, age groups, as well as groups with self-reported hypertension, diabetes, and hypercholesterolemia are presented in Table 1. Overall health knowledge levels increased from a mean score of 5.1 ± 2.3 to 6.2 ± 3.1 and the increase was statistically significant (t -test = -4.8 , $P = 0.000$).

The post-intervention health knowledge levels were statistically significant for education levels only ($F = 4.03$; $P = 0.004$). Participants' pre-post knowledge levels were higher with increasing educational levels. Participants who reported high cholesterol also had higher mean knowledge levels 6.1 ± 1.68 than those who did not have hypercholesterolemia or were not aware of it (4.9 ± 2.38 , t -test = -2.17 ; $P = 0.031$)

Distribution of clinical indicators by gender and age groups is shown in Table 2. More males than females

had high BP in the age groups of 18–44 and ≥ 45 years while more females had elevated BP as compared to males in both age groups. The differences found in BP by age groups and gender were found to be statistically significant ($\chi^2 = 24.87$, $P = 0.000$). More females in both aged 18–44 and ≥ 45 years had elevated TC while more males in younger age group had high TC ($\chi^2 = 7.49$, $P = 0.024$).

Distribution of self-reported health conditions and the health screening results is shown in Table 3. About 88% of the participants with glucose levels in the prediabetes range and 50% with BG levels in the diabetes range were not aware of their elevated BG levels, and the difference between screening results and self-reports of diabetes was statistically significant ($\chi^2 = 29.8$; $P = 0.000$). About 87% with elevated BP and 83% with high BP were not aware of their conditions, and the difference between self-reported BP and clinical readings was statistically significant ($\chi^2 = 9.17$; $P = 0.01$).

Table 4 shows differences in mean random and fasting BG and TC across gender and age groups. Mean random and fasting BG levels were higher in females than in males, and these differences in BG levels across males and females in two age groups of 18–44 and ≥ 45 years were statistically significant ($F = 5.76$, $P = 0.022$; $F = 9.33$; $P = 0.003$, respectively). Latinas

Table 1: Comparisons of baseline and post-intervention knowledge levels with demographics and self-reported conditions

Variable	<i>n</i>	Baseline knowledge, mean±SD	<i>t</i> -test (<i>P</i>)	Post-intervention knowledge, mean±SD	<i>t</i> -test (<i>P</i>)
Gender					
Male	77	4.78±2.33	-1.4 (0.163)	5.96±3.05	-0.85 (.396)
Female	87	5.29±2.31		6.37±3.06	
Educational level					
No formal education	58	4.69±2.31	<i>F</i> =1.54 (0.192)	5.19±2.69	<i>F</i> =4.03 (0.004)*
Less than high school	80	5.10±2.07		6.76±2.69	
High school	17	5.29±2.95		5.59±4.43	
Associates degree	3	7.66±1.53		9.33±0.58	
College degree	6	5.83±3.43		8.00±3.95	
Age groups (years)					
18-44	109	5.22±2.18	1.33 (0.185)	6.17±3.0	-0.015 (0.988)
45 and above	55	4.71±2.58		6.18±3.18	
Age (years), mean±SD			40±13.2		
Blood pressure (self-reports)					
Yes	15	5.07±2.60	-0.03 (0.976)	5.93±3.39	0.300 (0.764)
No	147	5.05±2.31		6.18±3.04	
Blood glucose (self-reports)					
Yes	16	5.12±2.09	-0.14 (0.892)	6.69±2.55	-0.72 (0.471)
No	146	5.04±2.37		6.10±3.11	
Total cholesterol (self-reports)					
Yes	20	6.1±1.68	-2.17 (0.031)*	7.3±2.96	-1.79 (0.076)
No	142	4.9±2.38		6.0±3.06	
Overall knowledge	164	5.05±2.33		6.18±3.05	-4.97 (<0.001)*

*Significant at $\alpha=0.05$. SD=Standard deviation

aged 45 years and above (138.3 ± 63.2 for random and 132.8 ± 66.2 for fasting) had higher values than younger age group of 18–44 years (110.4 ± 26.5 for random and 88.1 ± 13.3 for fasting). TC was higher for females than

males in the age group of 18–44 years (159.8 ± 35.2 vs. 140.4 ± 42.5) and was higher for females in age group of 45 years and above as well (186.6 ± 44.6 vs. 156.6 ± 45.6). The difference in the mean scores was statistically significant ($F = 8.44; P = 0.004$). Mean waist circumference was slightly higher in females in the age group of 45 years than males (40.1 ± 4.5 vs. 39.4 ± 4.7 inches), while the mean waist circumference was similar for both males and females (38 ± 5 inches) in the age group of 18–44 years ($F = 3.97; P = 0.048$).

Table 2: Distribution and comparisons of clinical indicators by gender and age groups

Clinical measure	Age groups, n (%)		χ^2 (P)
	18-44 years	≥45 years	
Blood glucose			0.02 (.892)
Normal			
Males	41 (46.6)	22 (51.2)	
Females	47 (53.4)	21 (48.8)	
Total	88 (100)	43 (100)	
High			
Males	3 (100)	4 (36.4)	
Females	0 (00)	7 (63.6)	
Total	3 (100)	11 (100)	
Blood pressure			24.87 (<0.001)*
Normal			
Males	11 (23.9)	9 (39.1)	
Females	35 (76.1)	14 (60.9)	
Total	46 (100)	23 (100)	
Elevated			
Males	13 (44.8)	4 (44.4)	
Females	16 (55.2)	5 (55.6)	
Total	29 (100)	9 (100)	
High			
Males	27 (81.8)	13 (61.9)	
Females	6 (18.2)	8 (38.1)	
Total	33 (100)	21 (100)	
Total cholesterol			7.49 (.024)*
Normal			
Males	41 (50)	22 (59.5)	
Females	41 (50)	15 (40.5)	
Total	82 (100)	37 (100)	
Elevated			
Males	0	2 (18.2)	
Females	3 (100)	9 (81.8)	
Total	3 (100)	11 (100)	
High			
Males	2 (66.6)	2 (40)	
Females	1 (33.3)	3 (60)	
Total	3 (100)	5 (100)	
BMI			3.46 (.177)
Normal			
Males	12 (50)	11 (73.3)	
Females	12 (50)	4 (26.7)	
Total	24 (100)	15 (100)	
Overweight			
Males	26 (55.3)	8 (33.3)	
Females	21 (44.7)	16 (66.7)	
Total	47 (100)	24 (100)	
Obese			
Males	13 (36.1)	7 (46.7)	
Females	23 (63.9)	8 (53.3)	
Total	36 (100)	15 (100)	

*Significant at $\alpha=0.05$. BMI=Body mass index

Discussion

To our knowledge, it is one of the first studies to look at health-related knowledge levels among Latinos in southwest Florida. Participants’ knowledge on emergency preparedness was limited. Most of the participants did not know how many days’ worth of food and water they had to keep while preparing for hurricanes and whether or not they could rely on social media such as Facebook to get hurricane updates with only 25% and 29% answering correctly to those questions. Participants in our study also had inadequate knowledge on chronic conditions, such as diabetes and heart diseases, as well as the differences in signs and symptoms, with an average of only 43% participants answering correctly before educational sessions. However, participants with previously diagnosed health conditions such as hypercholesterolemia had higher knowledge (6.1 ± 1.68 vs. 4.9 ± 2.38) given their prior exposure to some sort of health education from medical professionals; these findings are consistent with the previous studies.^[7,17] Similarly, participants with higher educational attainment had higher baseline knowledge; previous studies have found high educational attainment to be associated with high health-related knowledge and health literacy.^[26] It has to be noted that 43% of our sample reported having no or less than high school education, but there were statistically significant improvements in their knowledge levels after attending the health educational sessions. The significant change in knowledge levels has implications in the provisions of continuous health education in the community that lacks exposure to such activities otherwise. While more evidence should be accumulated to reinforce the effectiveness of this brief community-based education model, the results are encouraging to implement variations of health education activities with more rigorous measurements and follow-ups. As indicated previously in studies, health education improves health literacy, increases health participation, and removes barriers to educating patients with chronic diseases.^[15]

Overall, the percentage of persons aged 18 years and above with diagnosed diabetes in our sample was 9.7 which was slightly lower than crude percentages of

10.8 for Hispanics/Latinos in the US in 2017.^[33] The percentage of persons with undiagnosed prediabetes and diabetes in our study constituted 15.2%, of which only 5% was undiagnosed diabetes. The prevalence of undiagnosed diabetes among Mexican Americans is 6.3% in men and 3.8% in women.^[9] Undiagnosed diabetes in Latinos may be due to inadequate healthcare access, low healthy literacy, cultural barriers, and not being insured.^[6,34] This study points out the need for better healthcare access and awareness of signs and symptoms about diabetes in the community. More males than females had high BG levels in the age groups of 18–44 years while more females than males in the age

group of ≥45 years had high BG. Males in general have higher prevalence of diabetes than females.^[33]

Nearly 9.3% of the participants had diagnosed hypertension in our sample that was much lower than 17.6% for Latinos of 18 years and above in the United States, indicating underdiagnoses and lack of awareness.^[35] Latino males were disproportionately burdened by high BP; these findings were consistent with previous findings.^[9] In addition, 28% of the participants with no previous diagnosis of hypertension were found to have high BP. Similarly, hypercholesteremia was underreported in our sample with only about 14% being aware of the condition.^[9] There were significant differences in TC levels between males and females with females, showing higher mean values across the two age categories. Previous studies on gender differences on cholesterol and triglycerides have shown inconsistent findings.^[36,37]

Nearly 76% of the participants in our study were either overweight or obese as compared to 78.4% of Hispanics over the age of 20 years who were overweight or obese in the 2011–2014 National Health and Nutrition Examination Survey.^[38] Around 21% of males were found to be overweight as compared to 23% of females. In addition, 12% of males and 19% of females were obese; these findings were lower than the self-reported BMI levels in the National Health Interview Survey in 2017.^[39] Females had higher percentages of obesity in both age groups, finding consistent with the national data.^[9]

Table 3: Distribution of self-reports and clinical indicators

Clinical measure	Self-reports, n (%)		χ ² (P)
	Yes	No	
Blood glucose			
Normal	5 (4.4)	109 (95.6)	29.84 (<0.001)*
Prediabetes	2 (11.8)	15 (88.2)	
Diabetes	7 (50)	7 (50)	
Blood pressure			
Normal	1 (1.4)	68 (98.6)	9.17 (0.01)*
Elevated	5 (13.2)	33 (86.8)	
High blood pressure	9 (16.7)	45 (83.3)	
Total cholesterol			
Normal	15 (12.6)	104 (87.4)	1.62 (0.446)
Elevated	3 (21.4)	11 (78.6)	
High	2 (25)	6 (75)	

*Significant at α=0.05

Table 4: Comparisons of clinical indicators by age and gender groups

Clinical measure	Age groups, n (mean±SD)		F statistic (P)
	18-44 years	≥ 45 years	
Blood glucose (random)			
Male	33 (102.7±45.13)	21 (129.38±50.20)	9.33 (0.003)*
Female	33 (110.42±26.50)	22 (138.27±63.18)	
Blood glucose (fasting)			
Male	11 (77.55±29.09)	5 (93.2±41.05)	5.76 (0.022)*
Female	14 (88.07±13.34)	6 (132.83±66.23)	
Blood pressure (systolic)			
Male	51 (132.55±15.59)	26 (129.08±17.63)	0.53 (0.468)
Female	57 (117.28±12.65)	27 (124±16.57)	
Blood pressure (diastolic)			
Male	51 (73.67±12.31)	26 (68.81±11.39)	1.13 (0.289)
Female	57 (69.3±9.93)	27 (69.89±10.97)	
Total cholesterol			
Male	43 (140.39±42.46)	26 (156.58±45.55)	8.44 (0.004)*
Female	45 (159.76±35.22)	27 (186.63±44.61)	
BMI			
Male	51 (27.79±4.40)	26 (26.98±4.92)	0.031 (0.86)
Female	56 (29.27±5.29)	28 (29.75±5.47)	
Waist circumference			
Male	47 (38.09±4.97)	16 (39.40±4.70)	3.97 (0.048)*
Female	44 (38.00±4.75)	24 (40.14±4.51)	

*Significant at α=0.05. BMI=Body mass index, SD=Standard deviation

However, higher percentage of females were found to be overweight in our study while national surveys showed higher percentage of males to be overweight.^[9] Lower than national BMI levels can be speculated to be associated with visible physical activity that both men and women engage in this agricultural town where walking to nearby destinations is commonplace in addition to manual labor at workplaces.

To our knowledge, this is one among the first studies to look at health-related knowledge levels among Latinos in Immokalee. The educational intervention focused on the general adult Latinos in the community, unlike most of the previous studies that focused on those seeking healthcare. However, our study noted a few limitations. While measuring health-related knowledge, immediate change in knowledge levels was used to evaluate the effectiveness of health education, whether or not knowledge was retained to modify their skills and behaviors was not measured in this community-health study. They were no follow-ups on whether or not people had increased health literacy or increased engagement in healthy behaviors. In addition, knowledge is only one of the predictors of health behavior; measuring attitudes, skills, or motivation to healthy behaviors was beyond the scope of our study.^[40] Future studies could follow-up participants after tailored health education to assess if information was retained contributing to healthy behaviors. In addition, we had no information whether or not participants with positive health screenings sought medical advice or care. Assessment of post-health intervention knowledge levels may be skewed because of possible discussions post-education sessions. Measurements of glycated hemoglobin, high-density lipoprotein, low-density lipoprotein, or triglycerides were not done and neither were repeat measurements after positive test, as recommended by the ADA.

In this community-based study, health education was combined with health screenings. We believe that this approach was beneficial in reaching out to the community. Most people were interested in the health screenings; however, once there, they took the opportunity to attend health education event. Post-intervention knowledge scores suggest that the approach of having audiovisual and discussion combined led to increase in knowledge. The results of the health education events have implications in setting up a structured educational intervention in health clinics and migrant education programs in Immokalee. Most of the findings related to health conditions were lower than those reported in the other surveys implying either small and/or nonrepresentative sample of Latinos or under-reporting of previously diagnosed conditions.

Conclusions

The study highlights undiagnosed cases of prediabetes, diabetes, hypercholesterolemia, and hypertension among Latinos in the southwest region of Florida and more number of males than females to have hypertension and high cholesterol. Vulnerability of Latinos to chronic diseases and associated complications is further confounded by limited knowledge levels pertaining to prevention and recognition of signs and symptoms of chronic diseases. Latino males were disproportionately burdened by hypertension and diabetes, while more Latino females were either overweight or obese putting them at risk for chronic diseases. While health screenings in the community are routinely undertaken by health clinics, the reach is limited as Latinos underutilize health screenings. Brief health education sessions at workplaces or in the community could be undertaken to improve health literacy and health participation.

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Conflicts of interest

There are no conflicts of interest.

References

1. Colby SL, Ortman JM. Projections of the Size and Composition of the U.S. Population: 2014-60; 2015. Available from: <https://statistical.proquest.com/statistic+alnsight/result/pqpresultpage.preview?docType=PQSI&titleUri=/content/2015/2546-3.194.xml>. [Last accessed on 2019 Nov 09].
2. Hales CM, Carroll MD, Fryar CD, Ogden CL. Prevalence of obesity among adults and youth: United States, 2015-2016. *NCHS Data Brief* 2017;288:1-8.
3. Ogden CL, Carroll MD, Fryar CD, Flegal KM. Prevalence of obesity among adults and youth: United States, 2011-2014. *NCHS Data Brief* 2015;219:1-8.
4. Diabetes and Hispanic Americans; 2016. Available from: <https://minorityhealth.hhs.gov/omh/browse.aspx?lvl=4&lvlid=63>. [Last updated on 2019 Dec 19. Last accessed on 2020 Mar 13].
5. Heart Disease and Hispanic Americans; 2016. Available from: <https://minorityhealth.hhs.gov/omh/browse.aspx?lvl=4&lvlid=64>. [Last updated on 2020 Feb 14. Last accessed 2020 Mar 13].
6. Velasco-Mondragon E, Jimenez A, Palladino-Davis AG, Davis D, Escamilla-Cejudo JA. Hispanic health in the USA: A scoping

- review of the literature. *Public Health Rev* 2016;37:31.
7. Harris MI, Klein R, Welborn TA, Knudman MW. Onset of NIDDM occurs at least 4-7 yr before clinical diagnosis. *Diabetes Care* 1992;15:815-9.
 8. Schneiderman N, Llabre M, Cowie CC, Barnhart J, Carnethon M, Gallo LC, *et al.* Prevalence of diabetes among Hispanics/Latinos from diverse backgrounds: The Hispanic Community Health Study/Study Of Latinos (HCHS/SOL). *Diabetes Care* 2014;37:2233-9.
 9. Roger VL, Go AS, Lloyd-Jones DM, Benjamin EJ, Berry JD, Borden WB, *et al.* Executive summary: Heart disease and stroke statistics-2012 update: A report from the American Heart Association. *Circulation* 2012;125:188-97.
 10. Stewart SH, Silverstein MD. Racial and ethnic disparity in blood pressure and cholesterol measurement. *J Gen Intern Med* 2002;17:405-11.
 11. Chilton L, Hu J, Wallace DC. Health-promoting lifestyle and diabetes knowledge in Hispanic American adults. *Home Health Care Manag Pract* 2006;18:378-85.
 12. Harmon MP, Castro FG, Coe K. Acculturation and cervical cancer: Knowledge, beliefs, and behaviors of Hispanic women. *Women Health* 1996;24:37-57.
 13. Marin BV, Marin G. Effects of acculturation on knowledge of AIDS and HIV among Hispanics. *Hispanic J Behav Sci* 1990;12:110-21.
 14. Fitzgerald N, Damio G, Segura-Pérez S, Pérez-Escamilla R. Nutrition knowledge, food label use, and food intake patterns among Latinas with and without type 2 diabetes. *J Am Diet Assoc* 2008;108:960-7. Available from: <https://www.clinicalkey.es/playcontent/1-s2.0-S0002822308003258>. [Last accessed on 2019 Sep 09].
 15. Nutbeam D. Health literacy as a public health goal: A challenge for contemporary health education and communication strategies into the 21st century. *Health Promot Int* 2000;15:259-67. Available from: <https://search.proquest.com/docview/200046563>. [Last accessed on 2019 Nov 09].
 16. Misra R, McBride M, Xiang P, Lambert L, Kahar P, Sen CK. Learning preference and motivation to learn by age and gender in patients with chronic wound. *J Community Med Health Educ* 2012;2:127. doi: 10.4172/jcmhe.1000127.
 17. Fitzgerald N, Damio G, Segura-Pérez S, Pérez-Escamilla R. Nutrition knowledge, food label use, and food intake patterns among Latinas with and without type 2 diabetes. *J Am Diet Assoc* 2007;107:A83. Available from: <https://www.clinicalkey.es/playcontent/1-s2.0-S0002822307011091>. [Last accessed on 2019 Dec 11].
 18. Lirio NK, Kahar P. Sociodemographic and health indicators of foreign-born and U.S.-born Latino/as in Immokalee, Florida: A comparative study. 2020. Under review in *Social Work in Public Health*.
 19. Menke A, Casagrande S, Avilés-Santa ML, Cowie CC. Factors associated with being unaware of having diabetes. *Diabetes Care* 2017;40:e55-6.
 20. Werch CC, Grenard JL, Burnett J, Watkins JA, Ames S, Jobli E. Translation as a function of modality: The potential of brief interventions. *Eval Health Prof* 2006;29:89-125.
 21. Sacerdote C, Fiorini L, Rosato R, Audenino M, Valpreda M, Vineis P. Randomized controlled trial: Effect of nutritional counselling in general practice. *Int J Epidemiol* 2006;35:409-15.
 22. Whatnall MC, Patterson AJ, Ashton LM, Hutchesson MJ. Effectiveness of brief nutrition interventions on dietary behaviours in adults: A systematic review. *Appetite* 2018;120:335-47.
 23. Dotson KB, Dunn ME, Bowers CA. Stand-alone personalized normative feedback for college student drinkers: A meta-analytic review, 2004. *PLoS One* 2015;10:e0139518.
 24. McClure LA, Tannenbaum SL, Zheng DD, Joslin CE, Perera MJ, Gellman MD, *et al.* Eye health knowledge and eye health information exposure among Hispanic/Latino individuals: Results from the Hispanic community health study/study of Latinos. *JAMA Ophthalmol* 2017;135:878-82.
 25. Patino D, McQuistan MR, Qian F, Hernandez M, Weber-Gasparoni K, Macek MD. Oral health knowledge levels of Hispanics in Iowa. *J Am Dent Assoc* 2018;149:1038-48.
 26. Shaak K, Johnson MB, Marsh JK, Hansen SE, Banerjee ES, Stello B, *et al.* Exploring health beliefs among hispanic adults with prediabetes. *J Community Health* 2018;43:962-8.
 27. Furgurson KF, Sandberg JC, Hsu FC, Mora DC, Quandt SA, Arcury TA. Cancer knowledge among Mexican immigrant farmworkers in North Carolina. *J Immigr Minor Health* 2019;21:515-21.
 28. Sanderson M, Khabele D, Brown CL, Harbi K, Alexander LR, Coker AL, *et al.* Results of a health education message intervention on HPV knowledge and receipt of follow-up care among Latinas infected with high-risk human papillomavirus. *J Health Care Poor Underserved* 2015;26:1440-55.
 29. Molokwu J, Penaranda E, Flores S, Shokar NK. Evaluation of the effect of a promotora-led educational intervention on cervical cancer and human papillomavirus knowledge among predominantly Hispanic primary care patients on the US-Mexico border. *J Cancer Educ* 2016;31:742-8.
 30. Peña-Purcell NC, Boggess MM. An application of a diabetes knowledge scale for low-literate Hispanic/Latinos. *Health Promot Pract* 2014;15:252-62.
 31. Valdez A, Napoles AM, Stewart SL, Garza A. A randomized controlled trial of a cervical cancer education intervention for Latinas delivered through interactive, multimedia kiosks. *J Cancer Educ* 2018;33:222-30.
 32. Healthy weight: Assessing your weight. Centers for Disease Control and Prevention; 2017. Available from: https://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html. Last updated 29.8.2017. [Last accessed on 2019 Nov 09].
 33. Summary Health Statistics: National Health Interview Survey; 2017. Available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2017_SHS_Table_A-4.pdf. [Last accessed on 2019 Nov 09].
 34. Casagrande SS, McEwen LN, Herman WH. Changes in health insurance coverage under the affordable care act: A national sample of U.S. Adults with diabetes, 2009 and 2016. *Diabetes Care* 2018;41:956-62.
 35. Summary Health Statistics: National Health Interview Survey; 2017. Available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2017_SHS_Table_A-1.pdf. [Last accessed on 2019 Nov 09].
 36. Seidell JC, Cigolini M, Charzewska J, Ellsinger BM, Björntorp P, Hautvast JG, *et al.* Fat distribution and gender differences in serum lipids in men and women from four European communities. *Atherosclerosis* 1991;87:203-10.
 37. Shohaimi S, Boekholdt MS, Luben R, Wareham NJ, Khaw KT. Distribution of lipid parameters according to different socio-economic indicators- the EPIC-Norfolk prospective population study. *BMC Public Health* 2014;14:782.
 38. Health, United States 2016. Centers for Disease Control and Prevention, National Center for Health Statistics; 2017. 2017-1232 Available from: <https://www.cdc.gov/nchs/data/hs/hs16.pdf>. [Last accessed on 2020 Jan 02].
 39. National Health Interview Survey: National Center for Health Statistics. https://ftp.cdc.gov/pub/Health_Statistics/NC_HIS/NHIS/SHS/2017_SHS_Table_A-15.pdf. [Last updated on 2017. Last accessed 2019 Dec 11].
 40. Noar SM, Zimmerman RS. Health behavior theory and cumulative knowledge regarding health behaviors: Are we moving in the right direction? *Health Educ Res* 2005;20:275-90.