



Research Article

Decidetexto: Assessment of Weight Change after Smoking Cessation Treatment for Latino Smokers

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Abstract

Weight gain is a barrier to smoking cessation and is an important concern among Latino communities that already face the burden of high obesity rates. The objective of this study is to describe the relationship between smoking cessation and weight change among Latino adults who smoke participating in a mobile smoking cessation program. This study is a secondary data analysis of 208 participants enrolled in the Decidetexto, an mHealth smoking cessation randomized trial. The primary cessation outcomes were cotinine-verified 7-day point prevalence abstinence and self-reported abstinence at month 6. Weight and BMI were collected at baseline and month 6. Changes in weight and BMI between baseline and 6 months were associated with cessation outcomes. The average baseline weight was 83.4±40.1 lbs, the average BMI was 29.6±6.2, and most of the participants (n=160, 76.9%) were classified as overweight or obese. Participants who self-report abstinence gained 1.58 more pounds than those who did not quit (P=0.01, 95% CI [1.39, 10.47]). Participants who quit smoking validated with cotinine levels gained 3.41 more pounds compared to those who did not quit (P=0.02, 95% CI [0.67, 8.16]). Self-reported abstinence participants also had higher relative weight gain than participants who did not quit (P=0.01, 95% CI [0.83, 5.43]). BMI index did not change and was not correlated to cessation outcomes. Smoking cessation was related to weight gain among Latino adults who smoke, but BMI index did not change. This suggests that a culturally tailored mobile smoking cessation program can mitigate weight gain in this population.

Keywords: Smoking cessation; Latinos; Weight gain; mHealth; Culturally tailored

Introduction

Tobacco use is the leading cause of death among Latinos in the United States (U.S.), who suffer disproportionately poor health outcomes related to smoking [1,2]. This disease burden is projected to increase as the population of Latinos in the U.S. is expected to grow 114% by 2060 [3]. Estimates of smoking among Latinos overall is 8.2%, although some studies have found rates up to 38% for some Latino ethnicities [4-7] due, in part, to the heterogeneity of Latinos based on country of origin and acculturation to the U.S. [8-13]. Latinos face additional barriers that contribute to smoking rates and limits cessation, such as English proficiency and discrimination [14], general lack of healthcare access and under-utilization of services [15,16], and limited availability of culturally-tailored evidence-based smoking cessation interventions [17,18].

Contributing to the complexity of the health status of this growing minority population in the U.S, the obesity rate among Latino adults (44.8%) is the second highest among all racial and ethnic groups [19-21]. While smoking cessation efforts are of utmost importance among Latinos, smoking cessation has also been associated with increased weight and increased BMI [22-25]. Only 25% of former individuals who smoke maintain a healthy weight at one-year post-cessation. Consequently, concerns about weight gain during a quit attempt are often linked to poor cessation outcomes [22,23,25-27]. In addition to smoking and obesity, Latinos are at high risk for additional concurrent behavioral risk factors for obesity, including insufficient physical activity [28]. These risk factors combined further complicate the impact of smoking cessation and contribute to health disparities among Latinos.

Removing nicotine affects the central nervous system by creating reduced satiety and accelerated gastric emptying [29,30], decreased metabolic rate, and increased caloric intake due to the absence of nicotine's appetite suppressant effect [25,26]. Eating behaviors previously controlled with nicotine are left uninhibited after smoking cessation, contributing to post-cessation weight gain [31]. Weight gain during smoking cessation can increase obesity rates and reduce quit success among Latinos [32,33]. Attempts to address weight gain during a quit attempt have involved interventions such as meal replacement, dietitian support, pharmacologic agents, exercise, and Nicotine Replacement Therapy (NRT) [34,35]. However, trials have been hampered by methodological limitations including small sample sizes, lack of long-term follow-up, and underrepresentation of Latinos [34,35].

Culturally tailored smoking cessation interventions among Latinos have shown promising results on smoking abstinence [36]. However, the weight gain associated with successful treatment has been unaddressed in a population with an already high rate of obesity. Therefore, improving the health of Latinos in the US is directly linked to improving smoking cessation while mitigating weight gain in the process. The objective of this secondary data analysis is to assess weight change among Latinos participating in a mobile Health (mHealth) culturally tailored smoking cessation clinical trial to evaluate the effect of smoking cessation on participants' weight.

Methods

Study design

This study is a secondary data analysis of the Decídexto, an mHealth smoking cessation randomized clinical trial. The Hackensack University Medical Center, University of Rochester Medical Center, and The University of Kansas Medical Center Institutional Review Boards approved and monitored the study procedures. The details of the clinical trial intervention and protocol have been reported in previous publications [37].

Participants

A total of 457 US Latinos from 21 Latin American countries who smoke were enrolled in the parent study. Subjects were recruited through proactive and reactive methods in a community setting. These recruitment strategies, eligibility, and support data have been reported in detail elsewhere [36]. The baseline and 6 months follow-up assessments were completed in person by trained bilingual research staff. Participants were able to complete the assessments in either Spanish or English. For the present study, 208 Latino adults who smoke and had completed weight assessments were eligible.

Intervention

After completing the baseline assessment, participants were randomly assigned to either Decídexto intervention or Standard Care (control). In this study, Standard Care consisted of smoking cessation educational material and access to NRT via the study phone number provided within the educational materials. The intervention arm was supplemented with the Decídexto program, which is a smoking cessation mobile intervention that encompasses three integrated components: 1) tablet based software that collects smoking-related information to support the development of an individualized smoking cessation quit plan and guides the ensuing texts message program; 2) a 24-week text messaging counseling program with interactive capabilities and a library of more than 700 text messages; and 3) pharmacotherapy support [37].

Measures

Participants' weight was measured in light street clothes, without shoes, on high-quality calibrated digital scales. Absolute weight change was calculated as the difference between participants' weight assessed at baseline and 6-month follow-up in pounds. The relative weight gain was calculated as the percentage of weight gain comparing weight at the 6-month follow-up assessment to the weight assessment at baseline. BMI was calculated using participants' height and weight. The BMI categorization was defined as underweight/normal (BMI<25), overweight (25<=BMI<30), and obese/extremely obese (BMI>=30). BMI index change between baseline BMI and 6 months was defined as no change, decreased from a higher to a lower BMI categorization, and increased from a lower to a higher BMI categorization. The independent variables are treatment assignment (Decidexto vs. Standard Care), biochemically verified 7-day point prevalence abstinence and self-reported 7-day point prevalence abstinence. Potential confounding variables included in the analysis are participants' age, gender, education level, socioeconomic status, smoking history, previous quit attempts, and primary language.

Analysis

We evaluated the baseline weights and 6-month weights with smoking status after 6 months of participants in the trial among Latinos who smoke. Univariate analyses were performed to examine data distributions and missing data. Participants with missing endpoint smoking abstinence were considered individuals

who smoke. Missing data in potential confounding variables were imputed using the Markov Chan Monte Carlo (MCMC) method. After missing data treatment, bivariate data analyses were performed using the two-sample independent t-test for continuous data and chi-square test for categorical data. We further performed the multivariable regression models of weight change with participant treatment and smoking abstinence status after adjusting for confounding variables. General linear regression models were performed for weight gains, and a multinomial logit model was performed for BMI categorization changes. All analyses were performed in SAS 9.4® at two-tailed 0.05 significance level, with 0.10 being the marginal significance.

Results

The average age of participants was 48 years and over half were male (n=112, 53.8%). Approximately two-thirds of participants were predominantly Spanish speaking (n=144, 69.2%). Approximately half of the participants were light smokers, and two-thirds tried to quit smoking at least once in the past 12 months. Participants' average baseline weight was 183.4±40.1 lbs. The average BMI was 29.6±6.2, and most participants had BMI (n=160, 76.9%) categorized as overweight or obese (Table 1). Participant sociodemographic characteristics by intervention groups and smoking cessation status are provided in Table 2. Among participants with biochemically verified abstinence, those who smoked more than 10 cigarettes per day were less likely to achieve smoking abstinence at 6 months (p<0.05) (Figures 1 and 2).

Characteristics	Total (n=208)	Treatment group	
		Decidexto (n=98)	Standard of care (n=110)
Age, Mean (SD)	47.8(10.9)	48.0 (11.1)	47.7 (10.8)
Female, N (%)	96 (46.2)	46 (45.9)	51 (46.4)
High school graduate, N (%)	149 (71.6)	68 (69.4)	81 (73.6)
Under poverty, N (%)	63 (30.4)	26 (26.5)	37 (33.6)
Spanish speaker, N (%)	144 (69.2)	66 (67.4)	78 (70.9)
Heavy Smoking, N (%)	100 (48.1)	49 (50.0)	51 (46.4)
Ever quit smoking, N (%)	123 (59.1)	59 (60.2)	64 (58.2)
Weight, Mean (SD)	183.4(40.1)	182.8 (38.1)	184.0 (43.9)

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Weight gain (lbs), Mean (SD)	1.5(12.2)	1.7 (12.5)	1.2 (12.0)
% weight gain, Mean (SD)	1.0(6.2)	1.0 (6.5)	0.9 (5.9)
BMI, Mean (SD)	29.6(6.2)	29.4 (5.9)	29.7 (6.5)
BMI Index N (%)			
Normal	48 (23.1)	19 (19.4)	29 (26.4)
Overweight	75 (36.1)	41 (41.8)	34 (30.9)
Obese	85 (40.8)	38 (38.8)	47 (42.7)
BMI Index Change at Month 6			
Remained the same	164	78 (79.6)	96 (87.3)
Increased	15	9 (9.2)	6 (5.5)
Decreased	19	11 (11.2)	8 (7.3)

Table 1: Participants sociodemographic and smoking behaviors.

	Smoking abstinence (biochemically verified)		Smoking abstinence (self-reported)	
	Yes (n=35)	No (n=173)	Yes (n=64)	No (n=144)
Age, Mean (SD)	46 (10.4)	48.1 (11.0)	47.8 (10.8)	47.8 (11.0)
Female, N (%)	11 (31.4)	85 (49.1)	29 (45.3)	67 (46.5)
High school graduate, N (%)	27 (77.1)	122 (70.5)	50 (78.1)	99 (68.8)
Under poverty, N (%)	9 (25.7)	54 (31.2)	22 (34.4)	41 (28.5)
Spanish speaker, N (%)	28 (80.0)	116 (67.1)	49 (76.6)	95 (66.0)
Heavy Smoking, N (%)	13 (37.1)	87 (50.3)	22 (34.4)*	78 (54.2)*
Ever quit smoking, N (%)	22 (62.9)	101 (58.4)	41 (64.1)	82 (56.9)

*P-value <0.05

Table 2: Participants characteristics by smoking status.

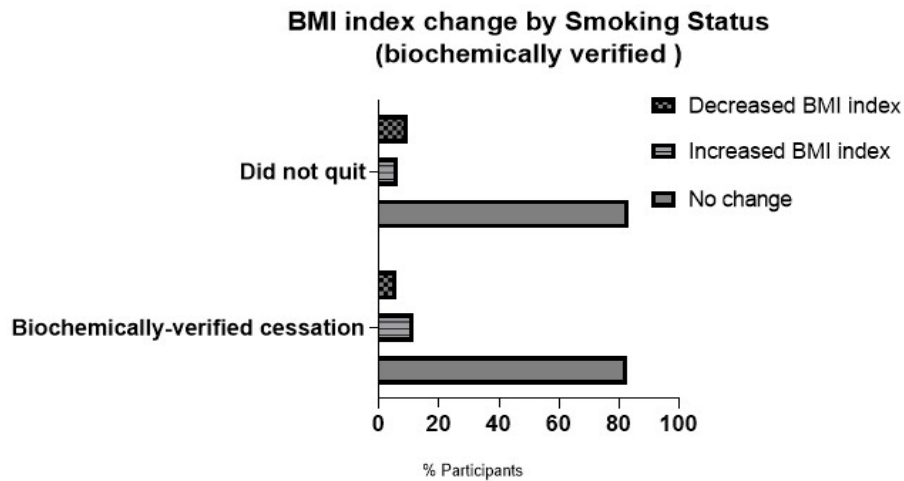


Figure 1: BMI index change from baseline to 6 months (biochemically verified).

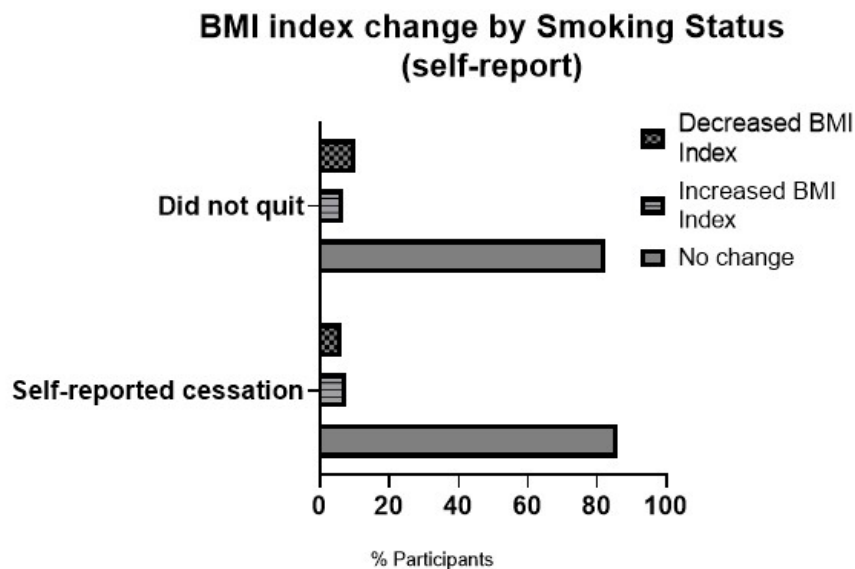


Figure 2: BMI index change from baseline to 6 months (self-reported).

Participants' baseline weight and BMI were comparable across treatment groups (control vs intervention) and abstinence groups (biochemically verified vs self-reported). At 6 months, participants' overall absolute and relative weight gain were 0.35 ± 12.09 lbs and $0.40 \pm 6.23\%$ on average. Weight gain was higher among participants who self-reported abstinence and biochemically verified abstinence (Table 3). In the multivariable analysis (Table 4), biochemically verified abstinence participants gained 3.41 more pounds compared to those who continued to smoke ($P=0.02$, 95% CI [0.67, 8.16]). Participants who self-reported abstinence gained 1.58 more pounds compared to those who continued to smoke ($P=0.01$, 95% CI [1.39, 10.47]). Participants who self-reported abstinence also had higher relative weight gain compared to those who continued to smoke ($P=0.01$, 95% CI [0.83, 5.43]). The majority of participants in both biochemically verified and self-reported abstinence groups (82.9% and 85.9% respectively) experienced no change in BMI index. Only 11.4% of participants with biochemically verified abstinence and 7.8% with self-reported abstinence experienced an increase in BMI index, and these changes were not statistically significant (Figures 3 and 4).

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	Smoking abstinence (biochemically verified)		Smoking abstinence (self-reported)	
	Yes (n=35)	No (n=173)	Yes (n=64)	No (n=144)
Weight, Mean (SD)	181.5 (28.6)	183.8 (43.3)	184.3 (39.1)	183.0 (42.1)
Weight gain (lbs), Mean (SD)	6.4 (9.3)*	0.4 (12.5)	4.2 (0.7)*	0.2 (11.2)
% weight gain, Mean (SD)	3.5 (5.0)*	0.4 (6.3)	2.1 (7.0)	0.4 (5.8)
BMI, Mean (SD)	28.4 (4.3)	29.8 (6.5)	29.5 (6.4)	29.6 (6.2)
BMI Index N (%)				
Normal	5 (14.3)	43 (24.9)	13 (20.3)	35 (24.3)
Overweight	19 (54.3)	56 (32.4)	25 (39.1)	50 (34.7)
Obese	11 (31.4)	74 (42.7)	26 (40.6)	59 (41.0)
BMI Index Change N (%)				
Remained the same	29 (82.9)	145 (83.8)	55 (85.9)	119 (82.6)
Increased	4 (11.4)	11 (6.4)	5 (7.8)	10 (6.9)
Decreased	2 (5.7)	17 (9.8)	4 (6.3)	15 (10.4)

*P-value <0.05

Table 3: Weight and BMI of participants by smoking status.

	Smoking Abstinence (biochemically verified)		Smoking Abstinence (self-reported)	
	Coefficient	95% CI	Coefficient	95% CI
Weight gain (lbs)	4.41*	(0.67, 8.16)	2.58*	(1.39, 10.47)
Relative weight gain (%)	1.90	(-0.01, 3.81)	3.13*	(0.83, 5.43)
BMI Index				
Remained the same	-	-	-	-
Increased	1.13	(0.34, 3.72)	1.99	(0.54, 7.36)
Decreased	0.51	(0.15, 1.77)	0.57	(0.11, 2.85)

*P-value <0.05

Table 4: Multivariate analysis of weight and BMI change.

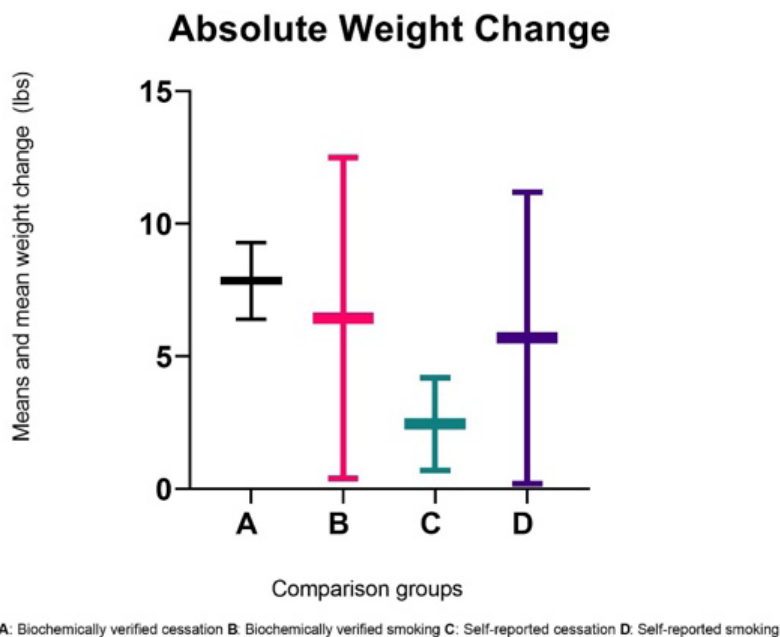


Figure 3: Absolute weight change among Latinos who smoke from baseline to 6 months.

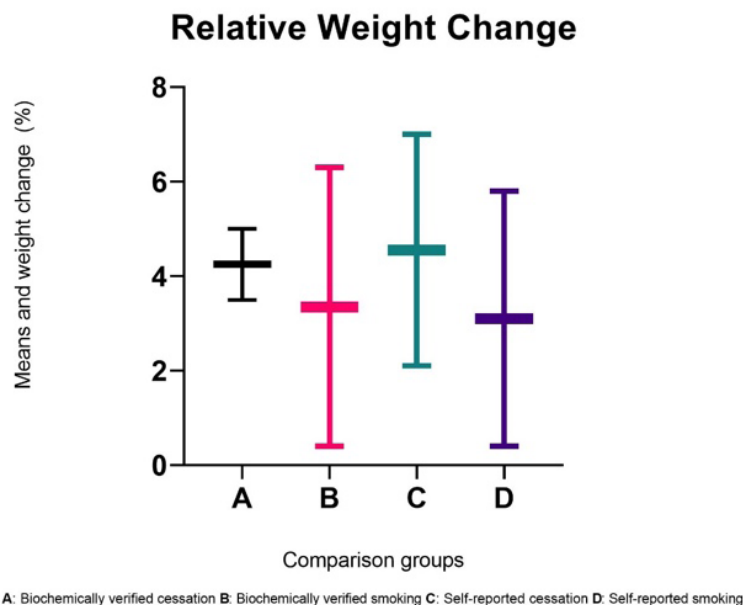


Figure 4: Relative weight change among Latino who smoke from baseline to 6 months.

Discussion

Weight change during smoking cessation among Latinos has been difficult to characterize due to the significant heterogeneity in methodology, sample size and characteristics, and duration of the study [24,34,35]. Decidetexto is a unique smoking cessation intervention that is culturally and linguistically tailored for Latinos. The results from this analysis demonstrated an alarming rate of overweight and obesity at baseline (36.1% and 40.8%, respectively) among Latino adults who smoke. Those who successfully achieved smoking abstinence at 6 months experienced some weight gain compared to those who did not quit. This trend was present when looking at both biochemically verified and self-reported abstinence groups, although this only reached statistical significance in the biochemically-verified sub-group. Weight gain among individuals who recently quit smoking has been reported to be on average 4.5 kg (9.9 lbs) within 6-12 months after quitting smoking [26,38]. In the present study, Latinos who quit smoking during the intervention gained an average of 5.3 lbs at 6 months, which is considerably less than previously reported in the literature. Importantly, BMI of subjects did not change significantly in either abstinence group.

Most healthcare providers would agree that the decrease in morbidity and mortality associated with smoking cessation outweighs the health risks associated with post-cessation weight gain [26]. Nutrition education, and possibly physical activity programs, should be prioritized in tobacco treatment interventions, as individuals who smoke tend to adopt health behaviors that contribute to poorer overall health. According to a study by McClure et al. [39], individuals who smoke, in general, do not meet the recommendations for the consumption of fruits and vegetables. For Latino adults who smoke, this is compounded by the low levels of physical activity and nutrition-related disparities that many Latinos experience [15-21]. This is of particular importance among immigrants with low acculturation status from specific countries [32,33,40,41], as these disparities contribute to the overall high rates of obesity in these populations. In contrast, those who adopt healthful lifestyles, including weight loss, during smoking cessation demonstrate prolonged abstinence from smoking [42]. As the majority of the participants in this study experienced overweight and obesity at baseline, including nutrition and other health-promoting behaviors during smoking cessation for Latinos is paramount.

Limitations

Weight change was not the primary outcome of this trial; therefore, the sample size included only the participants who completed the baseline and 6-month assessments in person. In addition, while the intervention included text messages related to physical activity and nutrition, the intervention did not leverage the

role of physical activity or eating habits in the content of the text messages delivered to participants. Therefore, we were unable to assess if messages addressing these topics had any unique effect on weight change. Future tobacco cessation interventions for Latino adults who smoke should systematically incorporate messages about physical activity and nutrition to better evaluate their effect on weight change during quit attempts.

Conclusion

This present study showed that weight gain during smoking cessation could be mitigated among Latinos. Latino adults who smoke were able to quit smoking without experiencing substantial weight gain or increase in BMI index. Although there was a difference in weight gain among those who achieved abstinence in this study, this weight gain averaged only five pounds, which is less than reported in previous literature. This result could be a motivating factor for participation in smoking cessation text message programs, such as Decidetexto, among Latinos. Future studies should also consider interventions that address multiple health behaviors, including nutrition and physical activity.

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Ethical Considerations

The study was approved by The Hackensack University Medical Center, the University of Rochester Medical Center, and The University of Kansas Medical Center Institutional Review Boards.

Data Availability

The datasets generated for this study are available on request to the corresponding author.

Conflicts of Interest

The authors declare no conflict of interest

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