A longitudinal analysis of e-cigarette use and smoking cessation

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INTRODUCTION

Although electronic cigarettes (e-cigarettes) are aggressively promoted as smoking cessation aids,[1] studies of their effectiveness for cessation have been unconvincing.[2, 3] One randomized trial comparing e-cigarettes with and without nicotine, and nicotine patch found no differences in 6-month quit rates.[2] Population-based, longitudinal studies have also not shown associations between e-cigarette use and quitting.[4, 5] A longitudinal, international study found that, although 85% of smokers who used e-cigarettes reported using them to quit, e-cigarette users did not quit more frequently than non-users (p=.516).[4] Among US quitline callers, e-cigarette users were less likely to have quit at 7 months than non-users.[5]

We employed a longitudinal analysis of a national sample of current US smokers to determine whether e-cigarette use predicted successful quitting, or reduced cigarette consumption.

METHODS

Participants were current smokers recruited from the Knowledge Networks (now GfK)[6] probability-based web-enabled panel who completed baseline (November 2011) and follow-up (November 2012) surveys. Of the 1549 participants from the 2011 survey who remained on the panel in 2012, 1189 were smokers and 81.3% completed the follow-up survey. Respondents who provided nonsensical data were excluded, yielding 949 participants. The Institutional Review Board of the University of California, San Francisco approved the study; all participants provided informed consent.

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Baseline e-cigarette use was measured with the question, "Other than cigarettes, have you used electronic cigarettes in the past 30 days (even once)?" (yes/no). Cigarettes per day (continuous), time to first cigarette (less vs. more than 30 minutes) and intention to quit (never, not in next 6 months, within next 6 months, within next month) were measured at baseline and follow-up. Bivariate comparisons were conducted using chi-squared, *t*-tests, and ANOVAs. Multivariate logistic regression analyses on quit status at one-year follow-up, and multivariate linear regression on cigarettes per day at follow-up controlling for consumption at baseline were conducted. Regressions including demographic variables (age, gender, education and ethnicity) found none of these variables were significant, so they were omitted from final models.

RESULTS

Significantly more women, younger adults and those with less education used e-cigarettes (Table 1). At baseline, a greater proportion of e-cigarette users reported having their first cigarette less than 30 minutes after waking compared to non-users (69.0% vs. 57.9%, p=0.046). Baseline e-cigarette use was not significantly associated with greater intention to quit smoking (p=0.09).

E-cigarette use at baseline did not significantly predict quitting one-year later (OR=0.71 [95% CI=0.35, 1.46], p=0.35). A second model including intent, consumption, and dependence covariates found intention to quit (OR=5.59 [95% CI=2.41, 12.98], p<0.001) and cigarettes per day (OR=0.97 [95% CI=0.94, 0.99], p=0.02) significantly predicted quit status; past 30 day e-cigarette use did not (OR=0.76 [95% CI=0.36, 1.60], p=0.46).

Among participants who reported smoking at both baseline and follow-up (n=821), e-cigarette use at baseline was not associated with a change in cigarette consumption (p=0.25), controlling for baseline cigarette consumption.

DISCUSSION

Consistent with the only other longitudinal population-level study with one-year follow-up,[4] we found that e-cigarette use by smokers was not followed by greater quitting, or reduction in consumption one year later. We lacked detailed data on e-cigarette use characteristics, such as frequency, duration, use patterns or motivation for use. Our smoking cessation data were self-reported. Although 13.5% of the sample quit, the low numbers of e-cigarette users in this sample (n=88), particularly e-cigarette users who quit (n=9), may have limited our statistical power to detect a significant relationship between e-cigarette use and quitting.

Nonetheless, our data add to the current evidence that e-cigarettes may not increase rates of smoking cessation. Regulations should prohibit advertising that claims or suggests e-cigarettes are effective smoking cessation devices until claims are supported by scientific evidence.

Acknowledgments

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Table 1

Descriptive characteristics of the sample who reported current (past 30-day) cigarette smoking at baseline and was retained at one-year follow-up.

	Entire Sample Percent or Mean(SD) (n=949)	Cigarette smoker who did not use e-cigarettes at baseline Percent or Mean (n=861)	Cigarette smokers who used cigarettes at baseline Percent or Mean(n=88)	Test Statistic and p value
Percent quit at one-year follow-up	13.5	13.8	10.2	χ^2=.88, df=1, p=0.35
Variable (at baseline)				
Gender (% female)	52.4	50.8	68.2	**χ^2=9.72, df=1, p=0.002**
Age (years)				**χ^2=13.33, df=3, p=0.004**
18-29	9.4	8.4	19.3	
30-44	20.5	21.4	12.5	
45-59	46.4	46.5	45.5	
60+	23.7	23.8	22.7	
Education				**χ^2=8.02, df=3, p=0.045**
Less than High School	9.2	8.8	12.5	
High School	39.6	39.0	45.5	
Some College	32.6	32.4	34.1	
College and higher	18.7	19.7	8.0	
Ethnicity				χ^2=3.18, df=4, p=0.53
White, non-Hispanic	75.3	75.0	78.4	
Black, Non-Hispanic	10.4	10.3	11.4	
Other, Non-Hispanic	2.6	2.8	1.1	
Hispanic	8.3	8.7	4.5	
More than one race, Non-Hispanic	3.3	3.1	4.5	
Days smoked in past 30	26.3(8.6)	26.3	26.3	t=-0.04, p=0.98
Cigarettes per day	14.5(9.7)	14.3	16.1	t=-1.57, p=0.41
Time to first cigarette				**χ^2=3.97, df=1, p=0.046**
Less than 30 minutes	59.0	57.9	69.0	
Greater than 30 minutes	41.0	42.1	31.0	
Intention to quit				χ^2=6.44, df=3, p=0.09
Never expect to quit	12.4	13.1	5.7	
Will quit, but not in next 6 months	57.0	57.3	54.5	
Will quit in next 6 months	23.8	23.0	31.8	
Will quit in next 30 days	6.8	6.7	8.0	