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Electronic cigarettes, quit attempts and smoking cessation: a 6-month follow-up

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ABSTRACT

Background and aims There is conflicting evidence that use of e-cigarettes promotes cessation in regular smokers, but contrasting findings may be due to differing definitions of vaping. The aim was to assess whether regular use of e-cigarettes while smoking is associated with subsequent smoking cessation. **Design** Baseline internet survey with outcomes measured at 6-month follow-up. **Setting** All French metropolitan territory. **Participants** A total of 2057 smokers aged 15–85 years were recruited through an access panel and responded to a 6-month follow-up: 1805 exclusive tobacco smokers and 252 dual users (tobacco plus regular e-cigarette users) at baseline. **Measurements** The three outcomes assessed at 6 months were: a minimum 50% reduction in the number of cigarettes smoked per day, quit attempts of at least 7 days and smoking cessation of at least 7 days at the time of follow-up. Logistic regressions were performed to model the three outcomes according to regular e-cigarette use at baseline, adjusted for socio-economic variables and smoking behaviours. **Findings** Baseline dual users were more likely than baseline exclusive tobacco smokers to have halved cigarette consumption [25.9 versus 11.2%, $P < 0.001$, adjusted odds ratio (aOR) = 2.6, confidence interval (CI) = 1.8–3.8]. Dual users at baseline were also more likely to have made a quit attempt of at least 7 days (22.8 versus 10.9%, $P < 0.001$, aOR = 1.8, CI = 1.2–2.6). No significant difference was found for 7-day cessation rates at 6 months (12.5 versus 9.5%, $P = 0.18$, aOR = 1.2, CI = 0.8–1.9). **Conclusions** Among people who smoke, those also using an e-cigarette regularly are more likely to try to quit smoking and reduce their cigarette consumption during the next 6 months. It remains unclear whether regular e-cigarette users are also more likely to stop smoking.

Keywords 6-month follow-up, electronic cigarette, France, quit attempts, smoking cessation, tobacco consumption.

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INTRODUCTION

Electronic cigarettes (e-cigarettes) have become extremely popular world-wide since their introduction at the end of the 2000s. In France, in 2014, 6.0% of people aged 15–75 years were current vapers (e-cigarette users) and half of these were daily vapers. Among vapers, 83 and 15% were current and former smokers, respectively [1].

E-cigarettes remain controversial. Because of their recent introduction, no long-term data are yet available to assess whether and to what degree they may be beneficial or indeed detrimental to health. The World Health Organization, via the Framework Convention on Tobacco Control, has invited Member States to regulate the e-cigarette market [2]. Public Health England recommends the use of e-cigarette for smokers who do not succeed in quitting smoking with other methods or who do not want to stop smoking [3]. The French High Council for Public Health issued an Opinion in 2016 in which it recognized the e-cigarette as a smoking cessation tool for people wishing to quit smoking, but highlighted the risk of re-normalizing smoking [4].

The question of whether there is a causal relationship between vaping and smoking cessation remains unanswered. The technical efficacy of e-cigarettes is addressed by trials where smokers try to quit. The 2016 Cochrane review concluded that there was limited evidence to support the efficacy of e-cigarettes in smoking cessation, but too few studies to provide a satisfactory conclusion [5–7].

Beyond the possible efficacy in the theoretical context of a randomized trial, whether e-cigarettes availability in the

general population promotes or inhibits smoking abstinence is questioned. On one hand, smokers using the e-cigarette but continuing to smoke may falsely believe that they are substantially reducing their health risks [8]. On the other hand, e-cigarettes are both attractive to smokers and seen widely as a tool for smoking cessation, and thus could encourage quit attempts among smokers doubtful about smoking cessation.

One systematic review including both real-life and laboratory setting studies noted a positive relationship between e-cigarette use and smoking cessation, but the evidence remained inconclusive due to the poor quality of the research performed [9]. Conversely, another review and meta-analysis concluded that the use of e-cigarettes was associated with significantly less quitting among smokers [10]. More precisely, results from cohort studies representing real-life situations differed from those from randomized trials, and authors argued that the specific context of the latter leads to conclusions which are not applicable in real-life situations. These two reviews summarize studies that selected any smoker who had used an e-cigarette, regardless of the frequency of their e-cigarette use or their motivation to quit.

The objective of the present cohort study was to compare quitting behaviours between exclusive tobacco smokers and tobacco plus regular e-cigarette users at two time-points during a 6-month period. A 50% minimum reduction in the number of cigarettes per day, quit attempts and smoking cessation were the three outcome measures. By retaining only regular vapers our study brings a new perspective, focusing upon smokers who indeed use the e-cigarette, and not taking into account smokers who have just tried it or occasional users.

METHODS

Design

On the occasion of the National Smoking Reduction Programme 2014–19 in France, Santé publique France, the national public health agency, launched a highly emotional media campaign with negative health effects messages (September 2014). A longitudinal study was conducted to evaluate the impact of the campaign, including questions on the use of e-cigarettes.

Three thousand smokers aged 15–85 years were recruited through an Access panel for two internet-based survey waves: just before the launch of the campaign (T0, September 2014) and approximately 6 months later (March 2015). Quotas used for the baseline sample were based on the following variables: sex, age, occupational status and socio-professional category, size of 'urban unit' (number of inhabitants in agglomeration, given by the French national statistics office) and region. Quotas have been computed to reflect the 2010 smokers' population structure observed in the French Health Barometer, which is a random regular survey on large representative samples [11]. Data at 6 months were weighted to correct attrition in terms of sex, age, region, size of urban unit and occupation.

Outcomes at 6 months were compared between exclusive tobacco smokers and tobacco plus regular e-cigarette users (dual users) at baseline. Socio-economic variables and smoking behaviours variables collected at baseline were used as covariates.

Study variables measured at baseline

The use of e-cigarettes was measured with the question: 'In the last 30 days, have you used an electronic cigarette? Regularly/sometimes/rarely/never?'. Individuals who reported using e-cigarettes 'regularly' at T0 were considered vapers at baseline.

Smoking status was ascertained by asking respondents if they currently smoked, even occasionally. Dual use was defined as current use of both e-cigarettes (regularly) and conventional cigarettes (even occasionally). Smoking dependence at baseline was measured by the Heaviness of Smoking Index (HSI) at T0, which combines the number of cigarettes smoked per day with the length of time before smoking their first cigarette in the morning. The score ranges from 0 to 6, with 0 being the least dependent and 6 the most dependent [12]. Intention to quit smoking during the next 6 months, attempt to stop at least 24 hours during the last 30 days and use of nicotine replacement therapy (NRT) during the last 30 days were asked at baseline.

Socio-demographic data collected at baseline included sex, age, level of education, occupational status (working, unemployed, student or inactive), socio-professional category (SPC) (farm worker/craftsman/retailer/ business owner; executive/ senior-level professional occupation; intermediate occupation; manual worker; employee) and household income per consumption unit (CU). Consumption units are used to compare households of different sizes and compositions by assigning a coefficient to each member of the household: one CU for the first adult in the household, 0.5 CU for other people aged 14 years or older and 0.3 CU for children under 14 [Organization for Economic Co-operation and Development (OECD) scale, French National Institute for Statistics and Economic Studies].

Follow-up measures: outcomes

Outcomes collected at follow-up (6 months) were:

- A minimum 50% reduction in the number of cigarettes smoked daily since T0, comparing the daily consumption of cigarettes reported at T0 and at 6 months measured with the question: 'How many cigarettes do you smoke on average (including rolled cigarettes)?'. This outcome

was assessed among 1860 respondents who still smoked at 6 months, quitters being excluded.

- A quit attempt of at least 24 hours in the previous 30 days measured by asking smokers at 6 months: 'Have you made a quit attempt of at least 24 hours in the last 30 days?' and a quit attempt of at least 7 days in the previous 30 days, measured by asking smokers at 6 months who made a quit attempt during the previous 30 days: 'How long was your longest quit attempt in the last 30 days?'. These outcomes were measured among 1921 people: 1860 respondents who still smoked at 6 months, plus 61 quitters who quit smoking within the last 30 days, quitters for more than 30 days being excluded.
- Smoking abstinence for at least 7 days or at least 30 days measured by asking to quitters at 6 months: 'For how long have you quit smoking?'. This outcome covers all the 2057 respondents at 6 months.

Former smokers at 6 months who vaped regularly at T0 or at 6 months were asked if vaping had helped them to quit (yes/no).

Analyses

Analyses were performed on respondents' follow-up data. Bivariate analyses were weighted to be representative of French smokers. Lost to follow-up data were considered missing.

Unweighted logistic regressions were estimated on the outcomes at follow-up according to e-cigarette use at baseline, adjusted for sex, age, occupational status, level of education, level of income per CU, socio-professional category, size of urban unit, HSI, intention to stop smoking in the next 6 months and quit attempts in the previous 30 days, reported at T0.

The interaction between e-cigarette use and HSI was tested by grouping the moderately and heavily dependent (HSI between 2 and 6), due to a low number of heavily dependent smokers. The interaction between e-cigarette use and use of NRT at T0 was also tested.

For sensitivity analysis, the models were tested by adding the use of assistance at T0 (quitline, health professionals, NRT). Those who started vaping between baseline and follow-up, as well as those who were not intending to quit in the next 6 months at baseline, were excluded consecutively from the analysis. Finally, the analyses were re-run by considering lost-to-follow-up as smokers. All statistical analyses were conducted using Stata/SE version 13.1.

RESULTS

Attrition and characteristics of respondents

The attrition rate at 6 months was 31.4%. It was higher for some socio-demographic subgroups ($P < 0.05$): women (33.9%), young people (48.3% for 15–24-year-olds and 36.9% for 25–34-year-olds), unemployed respondents (41.7%), students (45.9%), smokers with low education (34.1%) and low income (37.4% for monthly income below €900 per CPU). Tobacco consumption characteristics at baseline (HSI, quit attempts during the previous 30 days, motivation to quit, intention to quit, use of smoking quitline, use of electronic cigarettes) were similar in respondents and non-respondents at 6 months of follow-up.

Baseline characteristics for respondents at 6 months are shown in Table 1, according to vaping status. At baseline, dual users, compared with exclusive tobacco smokers, were more often males (62.1 versus 53.0%), and had on average both lower incomes and a lower level of education (37.4% of dual users were higher education graduates versus 47.3% of exclusive tobacco smokers). With respect to tobacco use, dual users were more likely to be moderately dependent (HSI score between 2 and 3), 50.3 versus 41.1%, whereas exclusive tobacco smokers were more likely to be weakly or heavily dependent. At baseline, vapers were nearly three times more likely to have attempted quitting and to have used NRT during the previous 30 days. Dual users reported more often that they intended to quit smoking within the next 6 months at baseline (63.0 versus 41.1%).

Smoking and vaping status at 6 months of follow-up (Fig. 1)

At 6 months, 10.3% of baseline exclusive tobacco smokers had stopped smoking regardless of the duration of abstinence: among them, 0.8% had quit tobacco but used e-cigarettes and 9.5% did not use either tobacco or e-cigarettes. Among the 89.7% who were still smoking at 6 months, 2.4% had become regular vapers.

At 6 months, 14.5% of baseline dual users had stopped smoking regardless of the duration of abstinence: 9.6% had quit cigarettes and e-cigarettes, 4.9% had stopped cigarettes and were exclusive e-cigarette users. Among those still smoking at 6 months (85.5%), 43.2% had quit e-cigarettes and 42.3% were still dual users.

Outcome measures and associated factors (Table 2)

Decline in tobacco cigarette consumption

Among baseline dual users and exclusive smokers, 25.9 and 11.2%, respectively, reduced the number of cigarettes they smoked per day by at least half ($P < 0.001$). After controlling for socio-demographic characteristics and smoking dependence, the association between vaping and decreased tobacco consumption was significant [adjusted odds ratio (aOR) = 2.6, confidence interval (CI) = 1.8–3.8].

Table 1 Characteristics at baseline of individuals who completed the 6-month follow-up, according to cigarette and e-cigarette use at baseline.

	Exclusive tobacco smokers n = 1805 %	*Dual users (tobacco plus regular e-cigarette users) n = 252* %	*Total n = 2057* %	*P-value*[a]
Sex				0.0124
Males (*n* = 1147)	53.0	62.1	54.1	
Females (*n* = 910)	47.1	37.9	45.9	
Age (years)				0.3555
15–24 (*n* = 233)	17.8	19.9	18.1	
25–34 (*n* = 436)	23.4	26.7	23.8	
35–49 (*n* = 786)	35.6	29.5	34.8	
50–85 (*n* = 602)	23.3	23.8	23.4	
Level of education				0.0224
Less than secondary (*n* = 554)	25.9	30.0	26.4	
Secondary (*n* = 526)	26.8	32.7	27.5	
Post-secondary (*n* = 977)	47.3	37.4	46.1	
Income/CU (tertile groupings)				0.0075
1st (low) (*n* = 497)	24.3	33.5	25.5	
2nd (*n* = 664)	32.5	31.5	32.4	
3rd (high) (*n* = 661)	30.4	27.7	30.0	
Missing (*n* = 235)	12.8	7.3	12.1	
Occupational status				0.9723
Working (*n* = 1404)	66.9	67.2	66.9	
Unemployed (*n* = 182)	9.8	10.1	9.8	
Student or inactive (*n* = 471)	23.4	22.7	23.3	
Socio-professional category				0.4816
Farm worker, craftsman, retailer, business owner (*n* = 106)	4.8	3.1	4.6	
Executive, senior-level professional occupation (*n* = 284)	11.0	12.5	11.2	
Intermediate occupation (*n* = 408)	17.1	18.6	17.3	
Employee (*n* = 774)	40.2	38.4	40.0	
Manual worker (*n* = 191)	9.0	11.8	9.3	
Without professional activity (*n* = 294)	17.8	15.7	17.6	
Size of urban unit (number of inhabitants)				0.0996
Fewer than 20 000 (*n* = 833)	42.6	39.7	42.3	
20 000 to fewer than 100 000 (*n* = 226)	12.6	18.7	13.4	
100 000 and more (*n* = 616)	28.9	26.3	28.6	
Agglomeration of Paris (*n* = 382)	15.9	15.3	15.8	
Intention to quit smoking in the next 6 months				< 0.001
No (*n* = 1140)	58.9	37.0	56.2	
Yes (*n* = 917)	41.1	63.0	43.8	
Attempted to quit for at least 24 hours in the previous 30 days				< 0.001
No (*n* = 1769)	88.4	68.4	85.9	
Yes (*n* = 288)	11.6	31.6	14.1	
Use of NRT in the last 30 days				< 0.001
No (*n* = 1881)	93.6	77.1	91.5	
Yes (*n* = 176)	6.4	22.9	8.5	
Heaviness of Smoking Index (HSI)				0.0288
0–1 (*n* = 901)	45.3	39.8	44.6	
2–3 (*n* = 871)	41.1	50.3	42.3	
4–6 (*n* = 285)	13.6	9.9	13.1	

(***Continues***)

Table 1. (Continued)

	Exclusive tobacco smokers n = 1805 %	*Dual users (tobacco plus regular e-cigarette users) n = 252* %	*Total n = 2057* %	*P-value*[a]
Number of cigarettes smoked per day				0.0692
0–10 (*n* = 1226)	60.7	69.1	61.8	
11–20 (*n* = 678)	32.0	26.8	31.3	
More than 20 (*n* = 153)	7.3	4.1	6.9	

[a]*P* = test of the difference between exclusive tobacco use and dual use. NRT = nicotine replacement therapy.

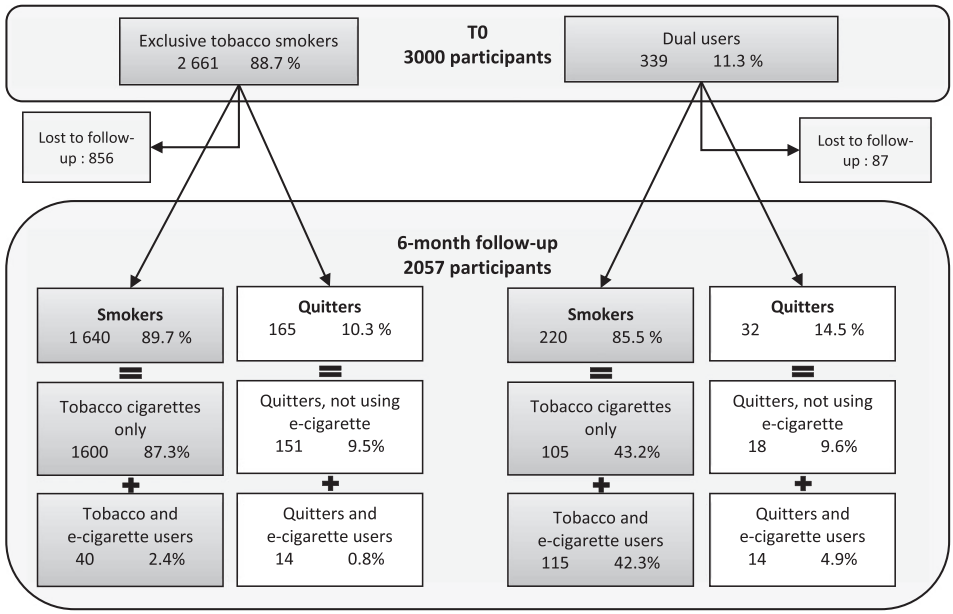

Figure 1 Flow-chart. For 6-month follow-up data, unweighted numbers and weighted percentages are presented

Moreover, highly dependent smokers were much less likely to have decreased their consumption (4.7%) by at least 50% than other smokers (17.2% for HSI = 0–1 and 11.4% for HSI = 2–3).

The interaction between vaping and dependence is significant: vaping is associated more strongly with a reduction of tobacco consumption for dependent smokers (HSI between 2 and 6, aOR = 3.2, CI = 1.9–5.4) than for those with none or low dependence (HSI between 0 and 1, aOR = 1.9, CI = 1.0–3.3).

Quit attempts

Baseline dual users were significantly more likely to have tried to quit smoking for at least 24 hours during the previous 30 days at 6 months (47.7%) than exclusive tobacco smokers (26.6%) ($P < 0.001$). They were also more likely to have tried to stop smoking for at least 7 days at 6 months: 22.8 versus 10.9% ($P < 0.001$). The association between e-cigarette use at baseline and quit attempts of at least 24 hours or 7 days at 6 months was significant after adjustment using logistic regressions (aOR = 1.7 CI = 1.3–2.4 and 1.8 CI = 1.2–2.6). Some socio-demographic and smoking characteristics were also linked to attempts to quit at 6 months: being male, intending to quit, having made an attempt to quit during the previous 30 days at baseline and having a lower level of tobacco dependence.

The interaction between vaping and dependence is significant: vaping is associated with an attempt to stop at least 24 hours or 7 days only for moderately or heavily dependent smokers (respectively, aOR = 2.2, CI = 1.5–3.3 and aOR = 2.2, CI = 1.3–3.7).

After adjustment, the effect of the e-cigarette does not differ according to the use of NRT at baseline (non-significant interaction).

Smoking cessation

With respect to smoking cessation at 6 months, no significant difference was found between baseline dual users and baseline exclusive tobacco smokers for 7-day

Table 2 Outcomes at 6 months: percentages by baseline socio-demographic variables and smoking and vaping characteristics. Adjusted odds ratios (aOR) from multivariate logistic regressions.

	Outcomes at 6 months														
	A minimum reduction of 50% in the number of cigarettes smoked per day n = 1860			*Quit attempt of at least 24 hours in the last 30 days n = 1921*			*Quit attempt of at least 7 days in the last 30 days n = 1921*			*Quit smoking for at least 7 days n = 2057*			*Quit smoking for at least 30 days n = 2057*		
Baseline characteristics[a]	*%*	*aOR*	*95% CI*	*%*	*aOR*	*95% CI*	*%*	*aOR*	*95% CI*	*%*	*aOR*	*95% CI*	*%*	*aOR*	*95% CI*
E-cigarette users at baseline	***			***			***								
No	11.2	1		26.6	1		10.9	1		9.5	1		8.5	1	
Yes	25.9	2.6***	(1.8–3.8)	47.7	1.7***	(1.3–2.4)	22.8	1.8**	(1.2–2.6)	12.5	1.2	(0.8–1.9)	10.2	1.1	(0.7–1.8)
Sex				**			*			***			***		
Males	14.1	1		32.0	1		14.3	1		13.4	1		12.2	1	
Females	11.7	0.8	(0.6–1.1)	26.1	0.7**	(0.6–0.9)	10.3	0.6**	(0.5–0.9)	5.7	0.5***	(0.3–0.7)	4.6	0.5***	(0.3–0.7)
Age (years)	***			*			*			***			***		
15–24	20.9	1		36.9	1		17.1	1		20.8	1		18.7	1	
25–34	13.9	0.7	(0.4–1.2)	30.3	0.8	(0.5–1.3)	13.5	0.9	(0.5–1.6)	9.1	0.5*	(0.3–0.9)	7.1	0.5**	(0.3–0.8)
35–49	10.9	0.7	(0.4–1.2)	27.3	0.9	(0.6–1.3)	11.2	0.9	(0.6–1.6)	7.1	0.4**	(0.3–0.7)	6.7	0.5**	(0.3–0.8)
50–85	10.1	0.6	(0.3–1.1)	25.5	0.9	(0.5–1.4)	9.8	0.9	(0.5–1.7)	6.2	0.5**	(0.3–0.8)	5.5	0.5*	(0.2–0.9)
Intention to quit smoking in the next 6 months	***			***			***			*					
No	10.3	1		21.0	1		8.9	1		8.3	1		7.5	1	
Yes	16.5	1.5**	(1.1–2.1)	40.0	1.7***	(1.4–2.2)	17.0	1.5*	(1.1–2.0)	11.8	1.7**	(1.2–2.3)	10.3	1.7**	(1.2–2.5)
Attempt to quit smoking for at least 24 hours in the previous 30 days at baseline	**			***			***								
No	12.0	1		23.6	1		9.9	1		9.6	1		8.6	1	
Yes	18.6	1.2	(0.8–1.8)	63.5	4.5***	(3.3–6.0)	27.7	2.8***	(2.0–4.0)	11.3	1.0	(0.6–1.6)	9.5	1.0	(0.6–1.6)
Heaviness of Smoking Index (HSI)	***			***			***			*			*		
0–1	17.2	1		34.9	1		15.8	1		12.2	1		11.0	1	
2–3	11.4	0.6***	(0.4–0.8)	28.5	0.6***	(0.5–0.8)	11.7	0.6***	(0.4–0.8)	8.8	0.7*	(0.5–1.0)	7.5	0.6**	(0.4–0.9)
4–6	4.7	0.2***	(0.1–0.5)	12.9	0.3***	(0.2–0.5)	3.6	0.3***	(0.1–0.5)	5.2	0.4**	(0.2–0.7)	5.0	0.3**	(0.2–0.7)

CI = confidence interval. [a]Adjusted for education, income, occupational status, socio-professional category and size of urban unit. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

cessation rates (12.5 versus 9.5%, $P = 0.18$) or 30-day cessation rates (10.2 versus 8.5%, $P = 0.42$). Again, after adjustment for baseline characteristics, the use of e-cigarettes was not associated with 7-day (aOR = 1.2, CI = 0.8–1.9) or 30-day (aOR = 1.1, CI = 0.7–1.8) abstinence. Characteristics related significantly to smoking cessation for at least 7 days were: being male, being aged 15–24 years, intending to quit and having a low level of tobacco dependence. No significant interaction was found with the level of dependence, nor with the use of NRT at baseline.

Among vapers (regular or occasional, at baseline or at 6 months) who had stopped smoking for at least 7 days at 6 months, 44% reported that e-cigarettes helped them to quit smoking. The older the people, the more they reported that the e-cigarette helped them to quit (69% for 50–85-year-olds, 52% for 25–49-year-olds and 22% for 15–24-year-olds, $P = 0.005$). There was no significant difference according to all others characteristics presented in Table 1.

Sensitivity analyses

The associations between baseline dual use and both quitting behaviours and smoking reduction at 6 months were unchanged when the use of cessation assistance at T0 was introduced in the models.

The associations between baseline dual use and all the outcomes at 6 months were unchanged:

- by taking out those who started vaping between baseline and follow-up;
- by keeping only those who intend to quit smoking within six months at baseline; and
- by making the assumption that those lost to follow-up kept smoking (Table 3).

DISCUSSION

Main results

At 6 months, smokers who used e-cigarettes regularly had made more quit attempts and had more often cut the number of cigarettes they smoked every day by at least half. The association with quit attempts was found only for moderately or heavily dependent smokers. Conversely, there was no evidence of a difference between exclusive tobacco smokers and dual users regarding smoking cessation. The results were the same among smokers intending to quit smoking within 6 months at baseline. As a result, frequent vaping may have only a short-term effect, encouraging quit attempts but not smoking cessation over the long term. This may be consistent with the fact that in France in 2014, almost half of vapers had only used e-cigarettes for less than 3 months [1].

Reducing the number of cigarettes smoked per day by at least half was associated with vaping, but dual users also appeared to be heavier smokers to start with. In 2014 in France dual users smoked approximately 21 cigarettes a day before using an e-cigarette, versus 11 among exclusive tobacco smokers [1]. Although reducing tobacco consumption may lower the health risks associated with tobacco, even smoking a few cigarettes keeps these risks extremely high [13,14]. Vaping could work against the smoking cessation process and its beneficial effect on health if, instead of trying to stop smoking tobacco altogether, some dual users only reduced their consumption, considering this to be a good enough achievement.

Comparison with other studies

The first two randomized control trials (RCT) in the literature showed that e-cigarettes were effective in helping smoking cessation among motivated smokers [6,7]. Since then, several cohort studies in the general population have presented different conclusions. An English cohort, performed using the same methodology as ours (online panel), showed that the use of e-cigarettes among smokers was associated with a higher number of quit attempts and a higher probability of halving tobacco consumption at 1 year. However, with regard to continued smoking, dual users remained as numerous as exclusive smokers [15,16]. Two American studies have shown that the use of e-cigarettes in addition to tobacco was not linked to any difference in smoking cessation at 1 year [17,18]. Finally, an Italian cohort study also showed that dual use did not help smoking cessation, but exclusive vapers were significantly more likely to remain abstinent at 1 year [19].

Our findings are mainly consistent with the results of these cohort studies. Our participants were smokers in the general population, and were not recruited based on their motivation to quit. This type of study is different from RCTs where the e-cigarette is provided free of charge, and presented and perceived as a smoking cessation tool. Another key difference is that RCTs select smokers who want to quit smoking, which is not necessarily the case in population studies. This may explain the different results between RCTs and general population studies [10]. Studying smokers who are not motivated to quit in the short term is interesting, as they represent a high proportion of smokers (72.7% did not want to quit in the next 6 months in 2014 in France [20]) that stakeholders try to draw to towards a quit attempt. NRT can be effective in supporting smoking cessation among unmotivated smokers [21]; if electronic cigarettes were also effective in this they could play a great part in tobacco control policies, as they are obviously more attractive to smokers than NRT.

Table 3 Outcomes at 6 months if lost to follow-up are considered smokers: percentages by baseline socio-demographic variables and smoking and vaping characteristics. Adjusted odds ratios (aOR) from multivariate logistic regressions.

	Outcomes at 6 months					
	Quit smoking for at least 7 days n = 3000			*Quit smoking for at least 30 days n = 3000*		
Baseline characteristics[a]	*%*	*aOR*	*95% CI*	*%*	*aOR*	*95% CI*
E-cigarette users at baseline						
No	6.0	1		5.3	1	
Yes	8.7	1.3	(0.9–2.1)	7.2	1.2	(0.8–2.0)
Sex	***			***		
Males	8.6	1		7.7	1	
Females	3.6	0.4***	(0.3–0.6)	3.0	0.5***	(0.3–0.7)
Age (years)	***			***		
15–24	10.7	1		9.7	1	
25–34	5.8	0.6	(0.4–1.1)	4.5	0.6*	(0.3–1.0)
35–49	5.2	0.6*	(0.4–1.0)	4.9	0.6	(0.4–1.0)
50–85	5.0	0.7	(0.4–1.2)	4.4	0.7	(0.4–1.3)
Intention to quit smoking in the next 6 months	*					
No	5.1	1		4.6	1	
Yes	7.8	1.6**	(1.2–2.2)	6.8	1.7**	(1.2–2.3)
Attempt to quit smoking for at least 24 hours in the previous 30 days at baseline						
No	6.2	1		5.5	1	
Yes	6.9	0.9	(0.6–1.4)	5.9	0.9	(0.6–1.4)
Heaviness of Smoking Index (HSI)	*			*		
0–1	7.9	1		7.1	1	
2–3	5.6	0.7*	(0.5–1.0)	4.8	0.6**	(0.4–0.9)
4–6	3.3	0.3**	(0.2–0.7)	3.1	0.3**	(0.2–0.7)

CI = confidence interval. [a]Adjusted on education, income, occupational status, socio-professional category and size of urban unit. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

Finally, our findings may also differ from those of the reviews because we focused our analyses on regular vapers.

Strengths and limitations

This study's longitudinal design enabled us to assess the changes in attitudes regarding the use of e-cigarettes, which is not possible with a cross-sectional analysis. Moreover, the analyses performed were adjusted for socio-economic variables and smoking behaviour at baseline: confounding biases were thus limited.

With regard to study limitations, a causal relationship cannot be demonstrated with a cohort study design, only a correlation between two observed events. Moreover, selection bias cannot be ruled out with quota sampling. The proportion of smokers who wanted to quit smoking was slightly higher in our cohort than in the French smoking population (63.2 versus 56.2%). More importantly, cohort respondents with at least a high-school diploma were over-represented: only 26% had an educational certificate lower than high-school diploma versus 65% in the French smoking population.

Dual users at baseline were more likely to have made quit attempts during the previous 30 days than exclusive tobacco smokers. Thus, they could be in treatment failure, as they did not manage to quit. But this potential confusion bias was controlled by adding quit attempts during the previous 30 days at baseline in the models.

In addition, a follow-up which lasts 6 months may be insufficient to observe and measure complex paths of use of e-cigarettes and their interaction with tobacco use. Those who had reduced their tobacco consumption at 6 months may have been in a process of gradually quitting smoking. A 1-year follow-up could therefore measure more clearly the evolution of consumption and smoking cessation over the long term.

Finally, as this study is a secondary analysis of data that were not set up initially to study the effect of e-cigarettes, the number of vapers is limited. The detection of a

significant difference regarding smoking cessation with a larger sample cannot be excluded.

Conclusion

The rapid spread of e-cigarettes in western societies provides great hope to professionals and stakeholders in the field of tobacco control and smoking cessation. These products may be an important public health device if their effectiveness in stopping smoking and their safety are proven. As rigorous experimental and observational studies are rare and present quite contradictory findings, it is important that research continues in this field.

Declaration of interests

None.

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