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ORIGINAL RESEARCH

Smoking E-CigaRette and HEat-noT-burn Products: the SECRHET study, a large observational survey among young people in Italy

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Abstract

Aim: Electronic cigarettes (eCig) and heated tobacco products (HTP), that heat a solution (e-liquid) to create vapour and tobacco at a temperature below the point of combustion, respectively, are emerging forms of smoking device widely diffused. The aim of this study was to investigate knowledge, attitudes and behaviour toward HTP among young people in Italy.
Methods: The Smoking E-CigaRette and HEat-noT-burn products (SECRHET) study was an online survey carried out in April 2019 using the platform Skuola.net, a platform where 2.5 million students are registered. Questions were related to knowledge about new generation smoking products, such as "Do you know what happens to tobacco when you use a heat-not-burn product?", "Do you think electronic cigarettes create addiction?", "Are products that use heated tobacco harmful to health?", "Are electronic cigarettes harmful to health?", "Have you ever heard of products that use heated tobacco?", "Is nicotine present in products that use heated tobacco?"
Results: A total of 13882 people completed the questionnaire, of which 8056 (58%) were females. Regarding smoking habits, 3393 (24.4%) declared to be current cigarette smokers, while 802 (5.8%) and 3173 (22.9%) were current and former e-cigarette smokers, respectively. Moreover, 715 (5.2%) and 1148 (8.3%) declared to be current and former heat-not-burn cigarette smokers. The variables associated to both eCig and HTP use were current smoking, age over 18 years, male gender, and residence in Central and Southern Regions. Concerning knowledge issues, almost half of respondents believe that electronic cigarettes are addictive and are harmful to health. Moreover, most of respondents do not know what happens to tobacco when using a heated tobacco device and if heated tobacco products are harmful to health.
Conclusion: The prevalence of eCig and HTP use is higher among young people in Italy compared to adults and older people, and requires adequate public health interventions.

Keywords: *electronic cigarettes, heat not burn tobacco products, Italy, smoking, young people.*

Conflicts of interest: None declared.

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Introduction

New next generation nicotine-containing products, i.e. electronic cigarette (eCig) and partial tobacco combustion devices (heat tobacco products, HTPs, sometimes referred to by the tobacco industry as heat not burn, HNB), are widely used at the international level with a current use ranged from 0% in Zambia to 17.2% in England (1), in particular among adolescents and young people (2). In Italy, 1.4% of the population aged ≥15 years tried HTP in 2017. More specifically, 1.0% of never-smokers, 0.8% of ex-smokers and 3.1% of current cigarette smokers had tried HTP, and 2.5% and 2.8% were current or former e-cigarette smokers (3).

The evidence on health implications and safety reported in the scientific literature is not conclusive. Concerning the use of eCig, a systematic review carried out in 2014 highlighted that no firm conclusions can be drawn on their safety, and it is difficult to consider them harmless (4). E-cigarettes do not contain tobacco and their liquid is heated so there is no partial combustion. A United Kingdom (UK) government review concluded that e-cigarettes are 95% less harmful then smoking (5). Moreover, there is inconsistent scientific evidence on the health risk characterization that is linked to the use of eCig (6). A more recent systematic review underlined that the passive exposure to eCig vapour has the potential to cause adverse health effects in bystanders (7).

HTP products produce lower levels of toxic chemicals, even if not considered risk-free (8). However, HTPs, unlike e-cigarettes, contain tobacco which has many harmful chemicals and may include some partial combustion which makes chemicals more harmful (9). HTPs may reduce exposure to some harmful chemicals but, as they are new products, it is not known whether they reduce the risk of disease (10).

In this context, many health authorities and scientific societies have raised questions concerning safety issues and effectiveness for smoking cessation of next generation products (11).

Nevertheless, little is known concerning the use of these devices among the youth population. The Global Youth Tobacco Survey conducted in Italy estimated e-cigarettes' vaping prevalence among adolescents aged 13–15 and found that use doubled between 2010 and 2018 for both boys (11.0-21.9%) and girls (5.9-12.8%) (12). In this framework, the aims of this study were: i) to assess knowledge, attitudes and behaviour toward HTPs among young people in Italy, and; ii) to assess the prevalence and selected correlates of HTP.

Methods

Study design and participants

An online self-administered anonymous survey was carried out, using a questionnaire (Appendix 1) previously validated (13), between April 5th and 12th 2019, using the website of "Skuola.net", an Italian network for information and insights for high school and university students (5 million visits per month and 2.5 million students registered). During this week, the students and other young people not attending school or university but registered on the website had the opportunity, on a voluntary basis and free of charge, to complete the survey by answering the questionnaire through a dedicated link published on the homepage (www.skuola.net). Hence, the sample for this survey was self-selected and therefore non probabilistic, avoiding the use of protocols to quantify invitations and response rates, as suggested by the American Association for Public Opinion Research (AAPOR) reporting guideline (14).

The questionnaire

A. The questionnaire was divided into four main sections for a total of twenty items:

– the first section was on demographic characteristics (age, gender, region of residence, type of school);

– the second part was related to the lifestyle and to the personal relationship with smoking ("Do you practice sports?", "In your family, except you if you are a smoker, does someone smoke?", "How many times have you smoked in the last 30 days?", "Have you ever vaped electronic cigarettes?", "Have you ever used heat-not-burn products (HNB)?");

– the third part concerned knowledge about next generation products ("Do you know what happens to tobacco when you use a heat-not-burn product?", "Do you think electronic cigarettes create addiction?", "Are products that use heated tobacco harmful to health?", "Are electronic cigarettes harmful to health?", "Have you ever heard of products that use heated tobacco?", "Is nicotine present in products that use heated tobacco?");

– the fourth section was concerning measures of susceptibility established for HNB ("If one of your best friends were to offer you a Heat Tobacco Product, would you try it?", "Would you recommend using products that use heated tobacco to a person who wants to stop smoking?").

Students were classified as non-smokers if they answered "never" to the question "How many times have you smoked in the last 30 days?" and smokers in all other cases.

Regarding the questions "Have you ever vaped electronic cigarettes?" and "Have you ever used heat-not-burn products?", students could choose one of the following answers: never; occasionally (I emptied less than 50 electronic cigarettes/HNB in my life); formerly (I've emptied at least 50 electronic cigarettes/HNB in my life but I haven't done it for at least 30 days); habitually (I have emptied at least 50 electronic cigarettes/HNB in my life including the last 30 days). Based on their answers, students were classified as non-smokers (never), former smokers (occasionally and in the past) and smokers (habitually).

Statistical Analysis

The descriptive analysis of categorical variables consisted of absolute frequencies and percentages.

Differences between groups for percentages of categorical variables were tested using the Chi-square test.

Moreover, four logistic regression models were computed, estimating odds ratios (ORs) with 95% confidence intervals (95% CIs): the dependent variable in the models was each question concerning current and ever use of eCig and HTP, and the independent variables were age, sex, type of school, geographic area and traditional tobacco smoking. Possible interactions between demographics and smoking status were tested in the multivariate analysis. Multicollinearity was checked using a matrix of correlation coefficients.

Due to the non probabilistic sampling, the analysis was weighted using a frequency variable derived from age and gender distribution of the sample.

The overall goodness of fit for the multivariable-adjusted models was checked using the Hosmer-Lemeshow test.

The statistical significance was set at $p \leq 0.05$.

The statistical analysis was carried out using IBM SPSS for Windows (Statistical Package for the Social Sciences, Version 25; SPSS, Inc., Chicago, IL).

Results

Description of the study sample

15149 students took part in the survey and a total of 13882 people completed the questionnaire (completeness rate 91.6%), of which 8056 (58%) were females and 5552 (40%) were males. The distribution of socio-demographic characteristics (age, attended

school, regional macroarea) of the sample is shown in Table 1.

Table 1. Selected demographics characteristics of the respondents

Variables	N=13882	(%)	Italian census data (%)*
Gender			
Female	8056	(58)	48.7
Male	5552	(40)	50.3
Age, years			
11-13	1619	(11.7)	-
14-15	3232	(23.3)	8.9
16-17	3457	(24.9)	8.8
18-19	2500	(18.0)	9.1
20-21	579	(4.2)	9.2
22-23	309	(2.2)	9.2
24-25	440	(3.2)	9.3
>25	1746	(12.6)	45.5
Attended school			
Junior High school	2700	(19.7)	-
Senior High school	8351	(61.0)	-
University	1165	(8.5)	-
Not attending School/University	1471	(10.7)	-
Macroarea of Italy			
North	5950	(43.4)	47.4
Center	3143	(22.9)	22
South	4628	(33.7)	30.6

* Data from Giovani. Stat, updated to 2020.

Regarding smoking habits, 3393 (24.4%) declared to be current cigarette smokers, while 802 (5.8%) and 3173 (22.9%) were current (at least 50 electronic cigarettes in their life including the last 30 days) and former (less than 50 electronic cigarettes in their life or at

least 50 electronic cigarettes in their life but never done it for at least 30 days) e-cigarette smokers. Moreover, 715 (5.2%) and 1148 (8.3%) declared to be current and former heat-not-burn cigarette smokers based on the same response modalities as electronic cigarettes. 269 (1.9%) were simultaneously e-cigarette and heat-not-burn smokers.

Univariate Analysis – Knowledge Questions

Five questions concerned knowledge about next generation products. To question "Do you think electronic cigarettes are addictive?" answered yes especially respondents aged under 18 (48.4%), females (48.0%), smokers (48.9%), middle school students (51.5%) and people from North of Italy (48.8%) (Table 2). Similar results came from question 2 "Are electronic cigarettes harmful to health?". To the remaining questions, "Do you know what happens to tobacco when using a heated tobacco device?", "Is nicotine contained in heated tobacco products?" and "Are heated tobacco products harmful to health?", most of the participants answered "I don't know" (Table 2).

Univariate Analysis – Behaviour Questions

Three questions concerned behaviour.

About question "Have you ever vaped electronic cigarettes?" answered never most respondents aged under 18 (75.6%), females (75.8%), those who practiced physical activity (72.1%), current smokers (83.7%), who attending middle school (87.1%) and was from North of Italy (73.1%) (Table 3).

About question "Have you ever used heated tobacco products?" 4796 (86.4%) males, 7103 (88.2%) females, 6504 (89.3%) who practiced physical activity and 5515 (83.6%) who did not practiced, 9632 (93.8%) current smokers, 2546 (94.3%) who attending middle school, 7432 (89.0%) who attending high school, 905 (77.7%) who attending university, 1056 (71.8%) who not attending any school, 5347 (89.9%) from north, 2649 (84.3%) from center, 3962 (85.6%) from south, 5247 (81.7%) with family smokers and 6772 (90.8%) without family smokers say that they have never used those products. About the question "If you have never used these products, would you try them?" 6430 (83.7%) males, 3591 (82.3%) females, 5515 (84.8%) who practiced physical activity and 4506 (81.3%) who did not practiced, 8497 (88.1%) current smokers, 2219 (87.0%) who attending middle school, 6104 (82.1%) who attending high school, 774 (85.5%) who attending university, 866 (80.8%) who not attending any school, 4401 (82.9%) from north, 2230 (84.1%) from center, 3299 (83.1%) from south, 4217 (80.0%) with family smokers and 5804 (85.7%) without family smokers answered no (Table 3).

Multivariate analysis

The logistic regression analysis revealed different results for current and ever e-cigarette or HNB smokers (Table 4). Being current cigarette smoker was the strongest predictors of both current e-cigarette (OR = 7.95; 95%: 7.93 – 7.97) and HNB smokers (OR = 6.41; 95%CI: 6.39 – 6.43). Being male and aged more than 18 were predictors of both current e-cigarette and HNB smokers. Concerning the attended school, interestingly, junior high school students showed higher odds of both being current e-cigarette and HNB smokers compared to senior high school students. Moreover, higher odds were also for university students and young people not attending school.

Table 2. Univariate analysis (knowledge questions)

Variables		Do you think electronic cigarettes are addictive?			Are electronic cigarettes harmful to health?			Do you know what happens to tobacco when using a heated tobacco device?			Is nicotine contained in heated tobacco products?			Are heated tobacco products harmful to health?		
		Yes N (%)	No N (%)	I don't know N (%)	Yes N (%)	No N (%)	I don't know N (%)	Right answer N (%)	Wrong answer N (%)	I don't know N (%)	Yes N (%)	No N (%)	I don't know N (%)	Yes N (%)	No N (%)	I don't know N (%)
		6405 (46.8)	2646 (19.3)	4633 (33.9)	6875 (50.3)	2240 (16.4)	4549 (33.3)	2619 (19.2)	2298 (16.8)	8748 (64)	5288 (38.8)	757 (5.6)	7593 (55.6)	638 (4.7)	7143 (52.3)	5871 (43)
Age	<18 years	3990 (48.4)	1600 (19.3)	2650 (32.2)	4303 (51.8)	1425 (17.2)	2515 (30.3)	1348 (16.3)	1369 (16.6)	5546 (67.1)	3174 (38.5)	360 (4.4)	4718 (57.2)	278 (3.4)	4603 (55.8)	3368 (40.8)
	≥ 18 years	2415 (44.4)	1046 (19.2)	1983 (36.4)	2572 (46.1)	815 (14.6)	2034 (36.5)	1271 (23.5)	929 (17.2)	3202 (59.3)	2114 (39.2)	397 (7.4)	2875 (53.4)	360 (6.7)	2540 (47.0)	2503 (46.3)
Sex	Male	2490 (45.3)	1356 (24.7)	1647 (30.0)	2605 (47.4)	1217 (22.2)	1669 (30.4)	1352 (24.6)	1044 (19.0)	3106 (56.5)	2348 (42.8)	366 (6.7)	2775 (50.6)	335 (6.1)	3024 (55.0)	2138 (38.9)
	Female	3816 (48.0)	1238 (15.6)	2899 (36.5)	4195 (52.7)	971 (12.2)	2787 (35.0)	1232 (15.4)	1197 (15.0)	5550 (69.6)	2867 (35.9)	373 (4.7)	4737 (59.4)	278 (3.5)	4053 (50.8)	3644 (45.7)
Physical activities	Yes	3568 (49.5)	1440 (20.0)	2205 (30.6)	3788 (52.5)	1215 (16.9)	2206 (30.6)	1419 (19.7)	1225 (17.0)	4569 (63.3)	3006 (41.8)	364 (5.1)	3830 (53.2)	288 (4.0)	4108 (57.1)	2800 (38.9)
	No	2837 (43.8)	1206 (18.6)	2428 (37.5)	3087 (47.8)	1025 (15.9)	2343 (36.3)	1200 (18.6)	1073 (16.6)	4179 (64.8)	2282 (35.4)	393 (6.1)	3763 (58.4)	350 (5.4)	3035 (47.0)	3071 (47.6)
Current smoker	Yes	4970 (48.9)	1642 (16.2)	3553 (35.0)	5241 (51.6)	1456 (14.3)	3458 (34.1)	1409 (13.9)	1646 (16.2)	7088 (69.9)	3403 (33.6)	500 (4.9)	6230 (61.5)	363 (3.6)	5163 (50.9)	4612 (45.5)
	No	1343 (40.4)	959 (28.9)	1021 (30.7)	1527 (46.2)	746 (22.6)	1034 (31.3)	1162 (35.0)	609 (18.3)	1548 (46.6)	1788 (54.2)	244 (7.4)	1267 (38.4)	258 (7.8)	1863 (56.4)	1183 (35.8)
School	Middle school	1374 (51.5%)	415 (15.6%)	877 (32.9)	1451 (54.1)	420 (15.7)	809 (30.2)	250 (9.3)	547 (20.4)	1883 (70.3)	984 (36.8)	144 (5.4)	1546 (57.8)	152 (5.7)	1506 (56.2)	1024 (38.2)

	High school	3905 (47.1)	1722 (20.8)	2665 (32.1)	4280 (51.7)	1429 (17.3)	2571 (31.1)	1843 (22.2)	1263 (15.2)	5186 (62.5)	3444 (41.6)	365 (4.4)	4479 (54.0)	242 (2.9)	4606 (55.7)	3428 (41.4)
	University	562 (49.0)	224 (19.5)	360 (31.4)	582 (51.0)	172 (15.1)	388 (34.0)	347 (30.2)	229 (19.9)	574 (49.9)	501 (43.8)	131 (11.4)	513 (44.8)	127 (11.1)	583 (51.0)	433 (37.9)
	Not attending School/University	497 (35.1)	246 (17.4)	671 (47.5)	500 (35.5)	188 (13.3)	721 (51.2)	153 (10.8)	222 (19.9)	1039 (73.5)	315 (22.2)	104 (7.3)	997 (70.4)	98 (6.9)	394 (27.7)	928 (65.4)
Macro-area	North	2876 (48.8)	1057 (17.9)	1962 (33.3)	3152 (53.4)	891 (15.1)	1856 (31.5)	1072 (18.2)	940 (15.9)	3883 (65.9)	2300 (39.1)	283 (4.8)	3304 (56.1)	237 (4.0)	3171 (53.8)	2490 (42.2)
	Center	1440 (46.3)	652 (21.0)	1017 (32.7)	1495 (48.2)	576 (18.6)	1029 (33.2)	759 (24.4)	535 (17.2)	1820 (58.4)	1278 (41.1)	262 (8.4)	1570 (50.5)	216 (7.0)	1700 (55.0)	1176 (38.0)
	South	2031 (44.7)	910 (20.0)	1604 (35.3)	2183 (48.1)	743 (16.4)	1617 (35.6)	773 (16.9)	787 (17.3)	3001 (65.8)	1674 (36.8)	200 (4.4)	2679 (58.8)	170 (3.7)	2227 (48.8)	2165 (47.5)
Family smok-ers	Yes	2838 (45.1)	1358 (21.6)	2095 (33.3)	3084 (49.1)	1177 (18.7)	2017 (32.1)	1445 (23.0)	1160 (18.5)	3682 (58.6)	2704 (43.2)	386 (6.2)	3170 (50.6)	346 (5.5)	3375 (53.8)	2555 (40.7)
	No	3567 (48.2)	1288 (17.4)	2538 (34.3)	3791 (51.3)	1063 (14.4)	2532 (34.3)	1174 (15.9)	1138 (15.4)	5066 (68.7)	2584 (35.0)	371 (5.0)	4423 (59.9)	292 (4.0)	3768 (51.1)	3316 (45.0)

Table 3. Univariate analysis (behaviour questions)

Variables		**Have you ever vaped electronic cigarettes?**			**Have you ever used heated tobacco products?**			**If you have never used these products, would you try them?**		
		> 50 cigarettes N (%)	**<50 cigarettes N (%)**	**Never N (%)**	**> 50 cigarettes N (%)**	**<50 cigarettes N (%)**	**Never N (%)**	**Yes N (%)**	**No N (%)**	**I don't know N (%)**
		802 (5.8)	3173 (22.9)	9907 (71.4)	715 (5.2)	1148 (8.3)	12019 (86.6)	848 (7)	10021 (83.2)	1178 (9.8)
Age	<18 years	283 (3.4)	1745 (21.0)	6280 (75.6)	152 (1.8)	476 (5.7)	7680 (92.4)	548 (7.1)	6430 (83.7)	705 (9.2)

	≥ 18 years	519 (9.3)	1428 (25.6)	3627 (65.1)	563 (10.1)	672 (12.1)	4339 (77.8)	300 (6.9)	3591 (82.3)	473 (10.8)
Sex	Male	384 (6.9)	1502 (27.1)	3666 (66.0)	269 (4.8)	487 (8.8)	4796 (86.4)	324 (6.8)	4102 (85.6)	368 (7.7)
	Female	368 (4.6)	1584 (19.7)	6104 (75.8)	386 (4.8)	567 (7.0)	7103 (88.2)	513 (7.2)	5828 (81.8)	782 (11.0)
Physical activities	Yes	315 (4.3)	1716 (23.6)	5253 (72.1)	238 (3.3)	542 (7.4)	6504 (89.3)	444 (6.8)	5515 (84.8)	547 (8.4)
	No	487 (7.4)	1457 (22.1)	4654 (70.5)	477 (7.2)	606 (9.2)	5515 (83.6)	404 (7.3)	4506 (81.3)	631 (11.4)
Current smoker	Yes	246 (2.4)	1431 (13.9)	8588 (83.7)	233 (2.3)	400 (3.9)	9632 (93.8)	388 (4.0)	8497 (88.1)	762 (7.9)
	No	542 (16.0)	1658 (48.9)	1192 (35.1)	459 (13.5)	707 (20.8)	2226 (65.6)	444 (19.8)	1395 (62.3)	400 (17.9)
School	Middle school	111 (4.1)	236 (8.7)	2353 (87.1)	73 (2.7)	81 (3.0)	2546 (94.3)	153 (6.0)	2219 (87.0)	178 (7.0)
	High school	314 (3.8)	2394 (28.7)	5643 (67.6)	215 (2.6)	704 (8.4)	7432 (89.0)	586 (7.9)	6104 (82.1)	747 (10.0)
	University	112 (9.6)	273 (23.4)	780 (67.0)	115 (9.9)	145 (12.4)	905 (77.7)	55 (6.1)	774 (85.5)	76 (8.4)
	Not attending School/University	235 (16.0)	197 (13.4)	1039 (70.6)	272 (18.5)	143 (9.7)	1056 (71.8)	42 (3.9)	866 (80.8)	164 (15.3)
Macro-area	North	235 (3.9)	1367 (23.0)	4348 (73.1)	182 (3.1)	421 (7.1)	5347 (89.9)	396 (7.4)	4441 (82.9)	517 (9.7)
	Center	202 (6.4)	748 (23.8)	2193 (69.8)	170 (5.4)	324 (10.3)	2649 (84.3)	182 (6.9)	2230 (84.1)	239 (9.0)
	South	338 (7.3)	1003 (21.7)	3287 (71.0)	332 (7.2)	334 (7.2)	3962 (85.6)	260 (6.5)	3299 (83.1)	412 (10.4)

Family smok-ers	Yes	523 (8.1)	1867 (29.1)	4035 (62.8)	455 (7.1)	723 (11.3)	5247 (81.7)	469 (8.9)	4217 (80.0)	585 (11.1)
	No	279 (3.7)	1306 (17.5)	5872 (78.7)	260 (3.5)	425 (5.7)	6772 (90.8)	379 (5.6)	5804 (85.7)	593 (8.8)

All p values are <0.05.

Table 4. Results of the logistic regression analysis

VARIABLES	E-CIGARETTE*		HEAT-NOT-BURN*	
	Current OR (95%CI)	Ever OR (95%CI)	Current OR (95%CI)	Ever OR (95%CI)
Gender				
Female (reference)	1	1	1	1
Male	1.85 (1.84-1.85)	1.92 (1.92-1.93)	1.20 (1.20-1.21)	1.38 (1.38-1.39)
Age, years				
< 18 (reference)	1	1	1	1
≥ 18	1.21 (1.21-1.22)	1.08 (1.08-1.09)	2.25 (2.24-2.26)	1.61 (1.60-1.61)
Attended school				
Junior High school	1.97 (1.96-1.98)	0.44 (0.44-0.44)	2.01 (2.00-2.02)	0.85 (0.85-0.86)
High school (reference)	1	1	1	1
University	1.87 (1.86-1.88)	0.76 (0.76-0.77)	2.16 (2.15-2.17)	1.45 (1.44-1.45)
Not attending School	4.85 (4.83-4.87)	0.93 (0.93-0.93)	6.37 (6.34-6.40)	3.57 (3.56-3.58)
Macroarea of Italy				
North (reference)	1	1	1	1
Center	1.35 (1.35-1.36)	1.01 (1.01-1.01)	1.36 (1.35-1.36)	1.36 (1.36-1.37)
South	1.36 (1.35-1.36)	0.99 (0.99-0.99)	1.41 (1.400-1.41)	0.99 (0.99-0.99)
Current smoking				
No (reference)	1	1	1	1
Yes	7.95 (7.93-7.97)	8.92 (8.91-8.93)	6.41 (6.39-6.43)	7.34 (7.32-7.35)
Hosmer-Lemeshow test (p)	13.8 (0.085)	31.8 (<0.01)	29.1 (<0.01)	43.3 (<0.01)

* The Results are related to a logistic regression model in which the outcome variables where being a current or an ever smoker of e-cigarette or heat-not-burn tobacco products. A full model was carried out. The results in bold are statistically significant.

Concerning the geographical macroarea, Center and Southern Italy showed higher odds of being current e-cigarette and HNB smokers compared to Northern Italy. The interaction between demographics and smoking status did not add any insight into the

multivariate analysis. No multicollinearity between variables was found.

Discussion

Our survey demonstrated that the prevalence of current use of eCig and HTP is around 5%-6% among the young population in Italy. This finding is in line with the results of the Global Youth Tobacco Surveys conducted in Italy among adolescents (13-15 years old) (12). The data provided by the Health Behaviour in School-Aged Children study (HBSC) involving students aged 11, 13 and 15 years in all Italian regions show that in 2018, the year of the last survey, the share of children who declare that they have smoked cigarettes at least one day in the last 30 days significantly increases with age, in both boys and girls, with a marked gender difference at 15 years (24.8% in boys, 31.9% in girls) (15).

Interestingly, the ever use of eCig is high not only in young people older than 18 years old (almost one third) but also in adolescents (almost one fourth). On the other hand, the use of HNB tobacco products is threefold in older young people if compared to adolescents' use (one fourth vs one twelfth).

These results indicate a higher use of both eCig and HTP when comparing to similar studies carried out in other countries both in Asia, such as in Japan (16,17) and in Korea (18), as well as in Europe (Germany) (19).

Considering the risk and harm associated with their use in adolescents and young adults, a coordinated effort from policy makers, public health agencies, parents, educators, health practitioners and researchers is essential to mitigate harms from e-cigarette use in this vulnerable population.

Concerning strengths, our survey was large (almost tenfold of the previous study in Italy)and comprises also older young people, including University students.On the other hand, we need to recognize some limitations. First of all, the issue concerning the access to the website, since not all students have access to the "Skuola.net" site to acquire information on a specific topic. Secondly, the study is based on self-reported data of students smoking status and reporting bias cannot be excluded at all. Finally, the sampling was non-probabilistic, but the number of people that entered the survey can be sufficient to draw some interesting conclusions, even if the external validity could be questionable. Non-probabilistic sampling can be a reasonable approach for online sample, and according to some authors inferences from this type of samples may also be possible and appropriate (20-22).

In conclusion, the prevalence of use of eCig and HTP is higher among young people in Italy and this requires adequate public health interventions. First of all, as suggested by the World Health Organization, marketing of HTPs should not be permitted unless there is conclusive evidence that, compared to conventional cigarettes, the product reduces exposure to harmful and potentially harmful components and reduces health risks. In addition, HTPs should be taxed similarly to other tobacco products, following the recommendations of the Conference of the Parties to the WHO Framework Convention on Tobacco Control. Furthermore, comprehensive smoke-free regulations prohibiting smoking in all public places and workplaces should be apply also to HNBs and finally advertising and promotions should be banned also for these new products.

References

1. Striley CW, Nutley SK. World vaping update. Curr Opin Psychiatry 2020;33:360-8. DOI: 10.1097/YCO.0000000000000617.
2. Yoong SL, Stockings E, Chai LK, Tzelepis F, Wiggers J, Oldmeadow C,

et al. Prevalence of electronic nicotine delivery systems (ENDS) use among youth globally: a systematic review and meta-analysis of country level data. Aust N Z J Public Health 2018;42:303-8. DOI:10.1111/1753-6405.12777.

3. Liu X, Lugo A, Spizzichino L, Tabuchi T, Pacifici R, Gallus S. Heat-not-burn tobacco products: concerns from the Italian experience. Tob Control 2019;28:113-4. DOI: 10.1136/tobacco-control-2017-054054.
4. Pisinger C, Døssing M. A systematic review of health effects of electronic cigarettes. Prev Med 2014;69:248-60. DOI:10.1016/j.ypmed.2014.10.
5. McNeill A, Brose LS, Calder R, Bauld L, Robson D. Evidence review of e-cigarettes and heated tobacco products 2018. A report commissioned by Public Health England. London: Public Health England, 2018. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/684963/Evidence_review_of_e-cigarettes_and_heated_tobacco_products_2018.pdf (accessed: August 24, 2021).
6. Zulkifli A, Abidin EZ, Abidin NZ, Nordin AS, Praveena SM, Ismail SN, et al. Electronic cigarettes: a systematic review of available studies on health risk assessment. Rev Environ Health 2018;33:43-52. DOI:10.1515/reveh-2015-0075.
7. Hess IM, Lachireddy K, Capon A. A systematic review of the health risks from passive exposure to electronic cigarette vapour. Public Health Res Pract 2016;26:2621617. DOI: 10.17061/phrp2621617.
8. Jankowski M, Brożek GM, Lawson J, Skoczyński S, Majek P, Zejda JE. New ideas, old problems? Heated tobacco products - a systematic review. Int J Occup Med Environ Health 2019;32:595-634. DOI:10.13075/ijomeh.1896.01433.
9. Auer R, Concha-Lozano N, Jacot-Sadowski I, Cornuz J, Berthet A. Heat-Not-Burn Tobacco Cigarettes: Smoke by Any Other Name. JAMA Intern Med 2017;177:1050-2. DOI:10.1001/jamainternmed.2017.1419.
10. World Health Organization. Heated tobacco products: a brief. WHO; 2020. Available from: https://www.who.int/publications/i/item/WHO-HEP-HPR-2020.2 (accessed: August 24, 2021).
11. Signes-Costa J, de Granda-Orive JI, Pinedo ÁR, Escrig AC, de Higes Martínez E, Castedo CR, et al. Official Statement of the Spanish Society of Pulmonology and Thoracic Surgery (SEPAR) on Electronic Cigarettes and IQOS®. Arch Bronconeumol 2019;55:581-6. DOI:10.1016/j.arbres.2019.04.023.
12. Gorini G, Gallus S, Carreras G, De Mei B, Masocco M, Faggiano F, et al. Prevalence of tobacco smoking and electronic cigarette use among adolescents in Italy: Global Youth Tobacco Surveys (GYTS), 2010, 2014, 2018. Prev Med 2020;131:105903. DOI:10.1016/j.ypmed.2019.105903.
13. La Torre G, Dorelli B, Ricciardi M, Grassi MC, Mannocci A. Smoking E-CigaRette and HEat-noT-burn products: validation of the SECRHET questionnaire. Clin Ter 2019;170:e247-51. Available from: http://www.clinicaterapeutica.it/ojs/index.php/1/article/view/117 (accessed: August 24, 2021).

14. American Association for Public Opinion Research. Best Practices for Survey Research. Available from: https://www.aapor.org/Standards-Ethics/Best-Practices.aspx (accessed: August 24, 2021).
15. Irwin CE Jr. Understanding the Health and Well-Being of Early Adolescents Throughout the World: Findings From the 2017-2018 Survey of Health Behavior in School-Aged Children. J Adolesc Health 2020;66:647-9. DOI:10.1016/j.jadohealth.2020.03.025.
16. Kuwabara Y, Kinjo A, Fujii M, Imamoto A, Osaki Y, Jike M, et al. Heat-not-burn tobacco, electronic cigarettes, and combustible cigarette use among Japanese adolescents: a nationwide population survey 2017. BMC Public Health 2020;20:741. DOI:10.1186/s12889-020-08916-x.
17. Kuwabara Y, Kinjo A, Fujii M, Imamoto A, Osaki Y, McNeill A, et al. Comparing Factors Related to Any Conventional Cigarette Smokers, Exclusive New Alternative Product Users, and Non-Users among Japanese Youth: A Nationwide Survey. Int J Environ Res Public Health 2020;17:3128. DOI:10.3390/ijerph17093128.
18. Lee Y, Lee KS. Association of alcohol and drug use with use of electronic cigarettes and heat-not-burn tobacco products among Korean adolescents. PLoS One 2019;14:e0220241. DOI:10.1371/journal.pone.0220241.
19. Kotz D, Kastaun S. E-cigarettes and heat-not-burn products: representative data on consumer behaviour and associated factors in the German population (the DEBRA study)). Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz 2018;61:1407-14. DOI:10.1007/s00103-018-2827-7.
20. Brick JM. Explorations in Non-Probability Sampling Using the Web. Proceedings of Statistics Canada Symposium 2014 - Beyond traditional survey taking: adapting to a changing world. Berret Koehler Publishers; 2014:1-6. DOI:10.1093/jssam/smt008.
21. Baker R, Brick JM, Bates NA, Battaglia M, Couper MP, Dever JA, et al. Summary Report of the AAPOR Task Force on Non-probability Sampling. J Surv Stat Methodol 2013;1:90-143. DOI:10.1093/jssam/smt008.
22. Bethlehem J, Cooben F. Web Panels for Official Statistics? Proceedings 59th ISI World Statistics Congress, 25-30 August 2013, Hong Kong. Available from: http://2013.isiproceedings.org/Files/IPS064-P1-S.pdf (accessed: August 24, 2021).

Appendix 1 – The questionnaire used in this survey

- Gender (F, M)
- Age (continuous variable)
- Attended school (Junior High school; High school; University; not attending)
- Macro-area (North; Center; South)
- Current tobacco smoking (Yes; No)
- E-cigarette user (Yes, actually; Yes, in the past; No)
- Have you ever vaped electronic cigarettes? (> 50 cigarettes; < 50 cigarettes; Never)
- Heat-not-burn (Yes, actually; Yes, in the past; No)
- Have you ever used heated tobacco products? (> 50 cigarettes; < 50 cigarettes; Never)
- If you have never used these products, would you try them? (Yes; No; I do not know)
- Do you think electronic cigarettes are addictive? (Yes; No; I do not know)
- Are electronic cigarettes harmful to health? (Yes; No; I do not know)
- Do you know what happens to tobacco when using a heated tobacco device? (Yes; No; I do not know)
- Is nicotine contained in heated tobacco products? (Yes; No; I do not know)
- Are heated tobacco products harmful to health? (Yes; No; I do not know)