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Electronic Cigarette in Saudi Arabia: An Online Survey

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ABSTRACT:
Background: E-cigarettes have been recently used to quit smoking. Their use became popular regardless of the fact that WHO considered them as a source of toxic fumes. Data about their safety is not yet confirmed, but major tobacco companies are advertising and producing them. Conducting clinical trials of these devices is challenging.

Purpose: To measure e-cigarette awareness in Saudi Arabia, and study their use among smokers and non-smokers.

Methodology: An electronic survey (Part of the validated WHO Global Adult Tobacco Survey) was used to reach participants through many internet communication applications. Microsoft Excel® was used to enter and analyze the data.

Results: 3027 participants were included in the analysis. Most of the participants were males (67.7%), aged between 18-40 years (73%), Saudi national (96 %), having a university degree (56.9%) and employed (56.9%). Awareness of e-cigarettes was high, as more than three quarters of respondents (82.5%) had heard about e-cigarettes. Less than half (42.5%) of those respondents who were aware of e-cigarettes have bought it or have seen anyone buying it. Among those respondents who were aware of e-cigarettes, one third (33.5%) had tried it. Of those who didn't ever smoke e-cigarettes, only (17.4%) were willing to try it in the current time. Less than one quarter of the respondents (22.3%) were smoking regular cigarettes. Of those, around two thirds (62.9%) were trying to quit smoking regular cigarettes, and among those, only (18.2%) were using e-cigarettes to help them do so. Only (8.8%) of the respondents believed that e-cigarettes is not harmful.

Conclusion: Smoking e-cigarettes is popular in Saudi Arabia, especially in non-smokers. Such popularity may "re-normalize" smoking, and lead to an increase in an "already alarming" smoking prevalence and addiction, especially to youngsters or at least a slowing down of the rate of decline.

Key words:smoking, e-cigarettes, addiction

INTRODUCTION

By looking at the history of smoking in the literature, it becomes apparent that cigarette smoking was uncommon throughout the world in 1900. Nevertheless, smoking rates increased substantially in many high-income countries during the first half of the 20th century, first among men and then, in some countries, among women.[1] Later on, at the middle of the 20th century, smoking was a cause of most deaths from lung cancer in USA and UK.[1] Subsequent reports showed that smoking caused even more deaths from diseases other than lung cancer.[1] In the second half of the 20th century, cigarette consumption continued to rise for some decades in high-income countries, and as usual, many developing low- and middle-income countries followed.[1]Although there has been widespread cessation in many high-income countries (in some, consumption per adult has been halved since the 1970s), about 1.3 billion people worldwide now smoke, most in low- and middle-income countries where cessation is uncommon.[1]

Since smoking is known to be harmful, health organizations and pharmaceuticalindustries are racing to reach their ultimate goal, tobacco absenteeism. This theoretical solution cannot work with every tobacco user, thanks to the addiction feature of Nicotine.[2]At the same time, most of the suggested tobacco addiction therapies are not promising,especially in the long term. In the best scenario of using Varenicline,[3] the absenteeismrate are about 20% after 12 monthsandis even less when using Nicotine Replacement Therapy (NRT).[4]Not surprisingly anymore, passive smoking is a known killer,[5,6]and the rising ofwhat so called "Harm Reduction Strategies",[7]haveemerged to protectnon-smokers from the harmful smoking fumes, or at least to minimize its harmful effects. Electronic Cigarettes, is so far, the newest harm reduction trend.[8]

Electronic cigarettes, or e-cigarettes, are Electronic Nicotine Delivery System (ENDS), which were synthesized to mimic the approximate sensory feeling of smoking usual cigarettes. While designs changes slightly between brands, most electronic cigarettes consist of the same basic components: atomizing vaporizer, airflow sensor, battery and in someof them, nicotine cartridge, all contained within a tube that looks like cigarette.[9]

E-cigarettes are popular. Recently, worldwide Google searches for "electronic cigarettes" have increased by 5000%,[10]this has been also foundbyAyers *et al*,[11]who did a survey from Australia, Canada, the United Kingdom and the U.S.and found that online popularity of ENDS are more of that of snusor NRTs, which have been in the market for alonger time, and is quickly outpacing Chantix or Champix (Varenicline).Although, there are no sufficient data supporting the industrial claims that e-cigarettes helps in quitting, the World Health Organization (WHO), yet considered them as a

source of toxic fumes, still studying the available data about their safety.[12] Additionally, since it appears that as ordinary cigarette smoking has continued to decline[1], major tobacco companies are diversifying by introducing their own e-cigarettes, among other novel products. In spring 2012, Lorillard started to advertise for "BluEcigs", marking the first entry of one of the baggiest tobacco industry into the e-cigarette market. Later in the same year, the other main tobacco company R.J. Reynolds was preparing their own e-cigarette known as "Vuse".

Conducting clinical trials of these devices is challenging: there is a lack of safety data, the regulatory environment makes conducting trials of such novel devices difficult,[13] and trials are expensive and time consuming to conduct. Therefore, until trials can be undertaken, user surveys are a means of gathering information about the effects of this product on a range of outcomes.[14]Although varieties of e-cigarette have been on the market since at least 2007,[15] nothing is known about the population awareness or user profile of e-cigarette use in Saudi Arabia, as no studies have been found in the literature, after an extensive search.

OBJECTIVE

The main objective of this study is to measure e-cigarette awareness in Saudi Arabia, and study their use among smokers and non-smokers.

METHODOLOGY

POPULATION: A health promoting Facebook account (Electronic Family Medicine Clinic),[16] was used to reach participants. This virtual clinic has 29000 subscribers. The clinic subscribers were sent invitations by direct Facebook massages and by smart phone texting applications over a 10 days period in September 2014. The same message was also disseminated through popular internet communication applications. The message included a link to a secured website where the survey could be completed.[17] Since an electronic survey was used, participant's user IP was allowedfor only one participation with no correction or "go back" option after submission. Moreover, all questions must be done before submission and all submitted surveys were accepted.

DATA COLLECTION TOOL: As e-cigarettes are mainly available though online stores, the internet web is a good logical tool to reach users and to have a response from youth and adults. We therefore posted an electronic survey form with the help of the e-cigarette part from the WHO Global Adult Tobacco Survey (GATS).[18]GATS is a standardized global survey for systematically monitoring adult tobacco use (smoked and smokeless) and tracking key tobacco control indicators.The survey was in Arabic, and composed of three parts. The first part was concernedwith demographic data include gender, age, educational level and employment status.

They were also asked whether they were Saudi nationals or non-Saudi's residing in Saudi Arabia, and to locate the province they resides in. The second part was asking if they ever heard of e-cigarettes, if they think that it is bad for health, if ever bought or know someone who bought it in Saudi Arabia or if they were thinking of trying it at the current time. The third and last part was for current ordinary smoker only. They were asked if they ever used e-cigarettes or were current user of e-cigarette, if they had been using dual smoking (conventional and e-cigarette in the same time), and whether they were daily users or using e-cigarette for quitting.

DATA ANALYSIS: If any question in the survey was left unanswered, the survey was considered incomplete and excluded from analysis. Microsoft Excel® was used to enter and analyze the data. Chi Square was calculated and the association between dependent and independent variables was considered statistically significant at $p<0.05$.

ETHICAL CONSIDERATIONS: Before starting the survey, they have to agree on using their data in our study and data collected were anonymous.

RESULTS

After excluding 88 partially completed surveys,3027 participants were included in the analysis. Most of the participants were males(67.7%), aged between 18-40 years (73%), Saudi national (96 %), having a university degree (56.9%) and employed (56.9%). The baseline characteristics of the study population are displayed in ***Table*** 1.

Awareness of e-cigarettes was high, as more than three quarters of respondents (82.5%) had heard about e-cigarettes (***Table 2***). Awareness was highest among the males, lowest among those who are unemployed, and was increasing with educational level.Awareness was not different in different age groups, and there was no statistically significant difference between Saudi nationals and non-Saudi nationals (***Table 3***). The rest of results will focus on those respondents who were aware of e-cigarettes.

Less than half (42.5%) of those respondents who were aware of e-cigarettes have bought it or have seen anyone buying it (***Table 2***). Most of those were males (52.2%, as compared to 23.8% of the females)and less than 40 years of age.Expectedly, unemployed respondents were the least who bought e-cigarettes or have seen anyone buying it (***Table 4***).

Among those respondents who were aware of e-cigarettes, one third (33.5%) had tried it (***Table 2***); they were dominantly males (41.7%, as compared to only 17.5% of the females) and university students (43%, as compared to 14.5% of unemployed, 36.8% of school students and 36.9% of employees). Those who were above 40

years of age were the least to try it (15.5%, as compared to around 37% for each of those who are <18 years of age and those who are 18-40 years of age). Among those who have ever smoked e-cigarettes, only (7.5%) were using it at the period of data collection, and an even lower percentage of them (4.1%) were using it on a daily basis (***Table 5***).

Of those who didn't ever smoke e-cigarettes, only (17.4%) were willing to try it in the current time (***Table 2***). More males (21%) were willing to try e-cigarettes, as compared to females (9.7%). Trying tendency decreased with age, since more adults and adolescents than older adults were willing to try it. As expected, students reported a higher willingness to try than other respondents (***Table 6***).

Less than one quarter of the respondents (22.3%) were smoking regular cigarettes.Of those, around two thirds (62.9%) were trying to quit smoking regular cigarettes, and among those, only (18.2%) were using e-cigarettes to help them do so. On the other hand, only (5.5%) of those who have ever smoked e-cigarettes have also smoked regular cigarettes simultaneously (***Table 2***).

Only (8.8%) of the respondents believed that e-cigarettes is not harmful, while (46.7%) believed that it is harmful and (44.5%) didn't know (***Table 2***). More of those who were in the age group of 18-40 and university students believed that e-cigarettes are harmful. This belief was also increasing with educational level (***Table 7***).

DISCUSSION

Not surprisingly, there is a high awareness about e-cigarettes among respondents, especially educated, employed or studying males. Being available for sale only through internet or buying from abroad, e-cigarettes would be expected to be more popular in the educated group, and especially those who can afford them.Smoking is still culturally unaccepted among females in Saudi Arabia, and so it wouldn't be surprising for e-cigarettes to be less popular among Saudi females. Strangely, the results didn't show any difference in the awareness among different age groups. But this might be due to the fact that most respondents were in the 18-40 years age group. These findings are not different from what have been found in United States,[19,20] and in United kingdom,[21,22] where the adult awareness are ranging from 77% of non-smokers and as high as 93% with smokers. Qatar, in the other hand, reported only half of the surveyed population heard about electronic cigarettes.[18]

One of the most important findings of this study is that nearly half of those who were aware about e-cigarette have already bought it, or knew somebody who did. This could reflect a dangerous attitude of people in Saudi Arabia, as there is a high chance of buying something when being aware about it, even if it was harmful. Again, and

as expected, males who were employed and under the age of 40 years were more likely to buy e-cigarettes. Of course, buying e-cigarettes is not the end of story, as around one third of the respondents have already tried it, which reflect the same attitude mentioned above. The behavior of trying e-cigarettes was associated with respondents in the high risk-taking age group (<40 years), male students in the university. An important inference here is that if a male university (or school) student hears about e-cigarettes, there is a high probability of buying and trying it, despite the "light" legalization efforts against it. A similar finding was found in a survey in UK, where one-third of participants reported using or trying e-cigarettes.[22] In US, on the other hand, surveys reported only (8.1%) of participants had tried e-cigarettes.[20] In Saudi Arabia, this behavior is very clear in the behavior of smoking regular cigarettes in. Saudi Arabia is now one of the top 10 cigarette-importing countries in the world. Report on tobacco control program of Ministry of Health in Saudi Arabia estimated economic, social and health costs associated with all tobacco use in the country to be $1.3 billion in 2010.[23]Although this is the first shine out about e-cigarette in Saudi Arabia, ordinary cigarette smoking has been well looked at in Saudi. Back to 2009, the prevalence of smoking in Saudi Arabia has been reported in Bassiony's review study,to be as high as 52.3%, with median of (22.6%).[24] Such data can predict the high risk group among Saudi population, which will be important with the emergence of such new smoking technique, i.e. e-cigarette.

Regardless of the high risk-taking behavior among young adult males, mentioned above, the study found a low probability of trying e-cigarettes in respondents who didn't smoke these e-cigarettes before, as only (17.4%) of those who didn't try it before are willing to do so in the future. This could also mean that those who have heard about e-cigarettes and wanted to try them have already made their decision and done so before.

Although this study was not aiming to study regular cigarettes smoking, but because the relationship between smoking regular and e-cigarettes is interesting to study, respondents were asked about regular cigarettes smoking. This study has shown that around two thirds (62.9%) of smokers (who smoke regular cigarettes) were willing to quit, but only (18.2%) were using e-cigarettes to help them do so. More importantly, the behavior of smoking (and probably the risk factors of smoking) was not the same in both groups (those who smoke e-cigarettes and those who smoke regular cigarettes), as only (5.5%) of respondents were smoking both cigarettes simultaneously. Putting in mind the previously discussed results that around one half and around one third of those who were aware about e-cigarettes have bought and tried it (respectively), it becomes highly probable that non-smokers are using e-cigarettes more than smokers who are

supposed to use them to quit.Differently from Saudi Arabia, a survey in UK found that a very small proportion (0.5%) of non-smokers who reported having tried e-cigarettes.[22] United States surveys, reported that (32.2%) of current smokers had tried e-cigarettes, probably to help them quit.[20]This is probably due to the fact the Saudi population in general is a youth population were 92% of Saudis are blew 55 years, in comparison to UK (71%) and US (72.9%).[25] Putting in mind the high prevalence of smoking habit in Saudi Arabia, youth are generally more interested in trying new trends and not forgetting the media and internet effect on advertising and selling such products.[26]

Another emerging concern and burden is that e-cigarettes may act as a gateway into smoking ordinary cigarettes. Such theory is under focus, since referring e-cigarette as a 'soft' drug with less harm and smell good but with some Nicotine can eventually lead to the 'hard' drugs, i.e. more harmful ordinary tobacco products.[27]

The idea that e-cigarette poses harmful effects was not well known by the respondents, unlike the high reported negative image about ordinary cigarettes in Saudi Arabia, where about 95% of high school and university students knows that smoking is harmful.[28] It seems that cloudiness of the harmful effects of e-cigarette is worldwide. In United Kingdom, a study found that participants consider e-cigarettes as less harmful than regular cigarettes and they were unsure about its safety.[21, 29, 30] Repetitively in other surveys from participants who lived in France, Canada, Belgium or Switzerland, they reported that they had some concerns about the possible toxicity of these e-cigarettes.[31] This can be explained by the fact that e-cigarette is new and still the safety data are not well studied. There is a worldwide movement to badly label e-cigarettes just like what is already known about ordinary cigarettes. As a matter of fact, e-cigarettes could be addictive just like ordinary cigarettes.

CONCLUSION

Smoking e-cigarettes is popular in Saudi Arabia, especially in non-smokers. Such popularity may "re-normalize" smoking, and lead to an increase in an "already alarming" smokingprevalence and addiction,especially to youngsters or at least a slowing down ofthe rate of decline.

Table 1: demographic characteristics

Characteristics		No (3027)	%
Gender			
	Male	2050	**67.7**
	Female	977	**32.3**
Age			
	<18	125	**4.1**
	18-40	2211	**73.0**
	>40	691	**22.8**
Nationality			
	Saudi	2897	**95.7**
	Non Saudi	130	**4.3**
Educational Level			
	Elementary	58	**1.9**
	Intermediate	189	**6.2**
	High School	766	**25.3**
	University	1721	**56.9**
	Post graduate	293	**9.7**
Working Status			
	Un employed	596	**19.7**
	School student	196	**6.5**
	University student	514	**17.0**
	Employee	1721	**56.9**

Table 2: Percentage of respondents answers to survey questions

Survey Question		No (3027)	%
Have you heard of the existence of the electronic cigarette?			
	No	529	**21.2**
	Yes	2498	**82.5**
Survey Question		**No (2498)**	**%**
Have you ever bought, or saw anyone buy electronic cigarettes?			
	No	1436	**57.5**
	Yes	1062	**42.5**
Have you ever smoked electronic cigarette?			
	No	1662	**66.5**
	Yes	836	**33.5**
If you didn't try it before, are you currently willing to try the electronic cigarette? (among 1662 who have not smoked e-cigarettes)			
	No	1373	**82.6**
	Yes	289	**17.4**
Do you think that the electronic cigarette is harmful to health?			

	No	220	**8.8**
	Yes	1166	**46.7**
	Don't know	1112	**44.5**
Do you smoke regular cigarettes now?			
	No	1940	**77.7**
	Yes	558	**22.3**
Do you use the electronic cigarette in the current period? (among 836 who tried it)			
	No	773	**92.5**
	Yes	63	**7.5**
Do you use electronic cigarettes daily? (among 836 who tried it)			
	No	802	**95.9**
	Yes	34	**4.1**
Do you use the electronic cigarette and ordinary together? (among 836 who tried it)			
	No	790	**94.5**
	Yes	46	**5.5**
Are you trying to quit smoking regular cigarettes now? (among 558 who are smoking regular cigarettes)			
	No	207	**37.1**
	Yes	351	**62.9**
Do you use the electronic cigarette to help you quit? (among 558 who are smoking regular cigarettes)			
	No	287	**81.8**
	Yes	64	**18.2**

Table 3: Awareness about e-cigarettes

Have you heard of the existence of the electronic cigarette?							
Characteristics	**No**	**Yes (2498)**		**No(529)**		**Chi Square**	**P-value**
		No	%	No	%		
Gender							
Female	**977**	626	**64.1**	351	**35.9**	310.473	**0.000**
Male	**2050**	1872	**91.3**	178	**8.7**		
Age							
<18	**125**	103	**82.4**	22	**17.6**	13.403	**0.001**
18-40	**2211**	1837	**83.1**	374	**16.9**		
>40	**691**	558	**80.8**	133	**19.2**		
Nationality							
Saudi	**2897**	2383	**82.3**	514	**17.7**	2.523	**0.112**
Non Saudi	**130**	115	**88.5**	15	**11.5**		
Educational Level							
Elementary	**58**	39	**67.2**	19	**32.8**	30.813	**0.000**
Intermediate	**189**	152	**80.4**	37	**19.6**		

	High School	**766**	615	**80.3**	151	**19.7**		
	University	**1721**	1425	**82.8**	296	**17.2**		
	Post graduate	**293**	267	**91.1**	26	**8.9**		
Working Status								
	Un employed	**596**	394	**66.1**	202	**33.9**	143.608	**0.000**
	School student	**196**	171	**87.2**	25	**12.8**		
	University student	**514**	449	**87.4**	65	**12.6**		
	Employee	**1721**	1484	**86.2**	237	**13.8**		

Table 4: Buying, or seeing someone buying e-cigarettes

Have you ever bought, or saw anyone buy electronic cigarettes?							
Characteristics	**No**	**Yes (1062)**		**No(1436)**		**Chi Square**	**P-value**
		No	%	No	%		
Gender							
Female	**852**	203	**23.8**	649	**76.2**	184.765	**0.000**
Male	**1646**	859	**52.2**	787	**47.8**		
Age							
<18	**96**	43	**44.8**	53	**55.2**	43.515	**0.000**
18-40	**1911**	875	**45.8**	1036	**54.2**		
>40	**491**	144	**29.3**	347	**70.7**		
Nationality							
Saudi	**2397**	1024	**42.7**	1373	**57.3**	1.030	**0.310**
Non Saudi	**101**	38	**37.6**	63	**62.4**		
Educational Level							
Elementary	**39**	10	**25.6**	29	**74.4**	5.403	**0.248**
Intermediate	**129**	55	**42.6**	74	**57.4**		
High School	**666**	284	**42.6**	382	**57.4**		
University	**1471**	636	**43.2**	835	**56.8**		
Post graduate	**193**	77	**39.9**	116	**60.1**		
Working Status							
Un employed	**496**	119	**24.0**	377	**76.0**	87.198	**0.000**
School student	**117**	56	**47.9**	61	**52.1**		
University student	**414**	190	**45.9**	224	**54.1**		
Employee	**1471**	697	**47.4**	774	**52.6**		

Table 5: Trying e-cigarettes

Have you ever smoked electronic cigarette?								
Characteristics	**No**	**Yes (836)**		**No(1662)**		**Chi Square**	**P-value**
		No	%	No	%		
Gender							
Female	852	149	**17.5**	703	**82.5**	183.789	**0.000**
Male	1646	687	**41.7**	959	**58.3**		
Age							
<18	96	36	**37.5**	60	**62.5**	54.960	**0.000**
18-40	1911	724	**37.9**	1187	**62.1**		
>40	491	76	**15.5**	415	**84.5**		
Nationality							
Saudi	2397	781	**32.6**	1616	**67.4**	0.014	**0.906**
Non Saudi	101	55	**54.5**	46	**45.5**		
Educational Level							
Elementary	39	12	**30.8**	27	**69.2**	1.587	**0.811**
Intermediate	129	38	**29.5**	91	**70.5**		
High School	666	222	**33.3**	444	**66.7**		
University	1471	494	**33.6**	977	**66.4**		
Post graduate	193	70	**36.3**	123	**63.7**		
Working Status							
Un employed	496	72	**14.5**	424	**85.5**	73.298	**0.000**
School student	117	43	**36.8**	74	**63.2**		
University student	414	178	**43.0**	236	**57.0**		
Employee	1471	543	**36.9**	928	**63.1**		

Table 6: Willingness to try e-cigarettes

If you didn't try it before, are you currently willing to try the electronic cigarette?							
Characteristics	**No**	**Yes (289)**		**No(1373)**		**Chi Square**	**P-value**
		No	%	No	%		
Gender							
Female	536	52	**9.7**	484	**90.3**	56.411	**0.000**
Male	1126	237	**21.0**	889	**79.0**		
Age							
<18	50	12	**24.0**	38	**76.0**	27.810	**0.000**
18-40	1341	250	**18.6**	1091	**81.4**		
>40	271	27	**10.0**	244	**90.0**		
Nationality							
Saudi	1591	273	**17.2**	1318	**82.8**	4.848	**0.028**
Non Saudi	71	16	**22.5**	55	**77.5**		

Educational Level								
	Elementary	33	5	**15.2**	28	**84.8**	4.351	**0.361**
	Intermediate	81	12	**14.8**	69	**85.2**		
	High School	410	92	**22.4**	318	**77.6**		
	University	999	162	**16.2**	837	**83.8**		
	Post graduate	139	18	**12.9**	121	**87.1**		
Working Status								
	Un employed	313	22	**7.0**	291	**93.0**	32.129	**0.000**
	School student	88	21	**23.9**	67	**76.1**		
	University student	300	88	**29.3**	212	**70.7**		
	Employee	961	158	**16.4**	803	**83.6**		

Table 7: Knowledge about e-cigarettes harm

Do you think that the electronic cigarette is harmful to health?									
Characteristics	**No**	**Yes (1166)**		**No (220)**		**Don't know (1112)**		**Chi Square**	**P-value**
		No	%	No	%	No	%		
Gender									
Female	852	372	**43.7**	61	**7.2**	419	**49.2**	12.818	**0.002**
Male	1646	794	**48.2**	159	**9.7**	693	**42.1**		
Age									
<18	96	37	**38.5**	21	**21.9**	38	**39.6**	56.941	**0.000**
18-40	1911	945	**49.5**	170	**8.9**	796	**41.7**		
>40	491	184	**37.5**	29	**5.9**	278	**56.6**		
Nationality									
Saudi	2397	1123	**46.9**	213	**8.9**	1061	**44.3**	1.646	**0.439**
Non Saudi	101	43	**42.6**	7	**6.9**	51	**50.5**		
Educational Level									
Elementary	39	3	**7.7**	3	**7.7**	21	**53.8**	23.129	**0.000**
Intermediate	129	9	**7.0**	9	**7.0**	73	**56.6**		
High School	666	49	**7.4**	49	**7.4**	343	**51.5**		
University	1471	138	**9.4**	138	**9.4**	597	**40.6**		
Post graduate	193	21	**10.9**	21	**10.9**	78	**40.4**		
Working Status									
Un employed	496	206	**41.5**	23	**4.6**	267	**53.8**	59.400	**0.000**
School student	117	47	**40.2**	23	**19.7**	47	**40.2**		
University student	414	217	**52.4**	53	**12.8**	144	**34.8**		
Employee	1471	696	**47.3**	121	**8.2**	654	**44.5**		

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