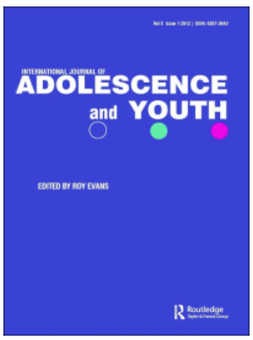

International Journal of Adolescence and Youth

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rady20

The predictors of adolescents' smoking in Egypt, the global youth tobacco survey findings

Maryam Ba-Break, Farag Moftah, Dhekra Amin Annuzaili, Mohammed Y Emran, Arwa Ali H Al-Khawlani, Kawkab A AL-Masnaah & Doaa Mohamed Osman

To cite this article: Maryam Ba-Break, Farag Moftah, Dhekra Amin Annuzaili, Mohammed Y Emran, Arwa Ali H Al-Khawlani, Kawkab A AL-Masnaah & Doaa Mohamed Osman (2021) The predictors of adolescents' smoking in Egypt, the global youth tobacco survey findings, International Journal of Adolescence and Youth, 26:1, 460-470, DOI: 10.1080/02673843.2021.1991402

To link to this article: https://doi.org/10.1080/02673843.2021.1991402

Published online: 21 Oct 2021.

INTERNATIONAL JOURNAL OF ADOLESCENCE AND YOUTH
2021, VOL. 26, NO. 1, 460–470
https://doi.org/10.1080/02673843.2021.1991402

Routledge
Taylor & Francis Group

The predictors of adolescents' smoking in Egypt, the global youth tobacco survey findings

Maryam Ba-Break[a], Farag Moftah[b], Dhekra Amin Annuzaili[c], Mohammed Y Emran[d], Arwa Ali H Al-Khawlani[e], Kawkab A AL-Masnaah[f] and Doaa Mohamed Osman[b]

[a]Nuffield Centre for International Health and Development, University of Leeds, Leeds, UK; [b]Public Health and Community Medicine Department, Faculty of Medicine, Assiut University, Egypt; [c]Senior Public Health Advisor, Ministry of Public Health and Population, Sanaa, Yemen; [d]Family Medicine Department, King Khalid University Hospital, Riyadh, Saudi Arabia; [e]Gynecology and Obstetric Department, Sulaiman Al Habib Hospital – Al-Qassim, Riyadh, Saudi Arabia; [f]Gynecology and Obstetric Department, AL-Emeis Hospital Gizan, Sabya, Saudi Arabia

ABSTRACT

This study secondary analysed the last Global Youth Tobacco Survey (GYTS) implemented in Egypt which is a cross-sectional school-based survey used self-administered questionnaire to research smoking among a national representative sample of (2,141) adolescents aged 13–15 years. The study identified that male adolescents are more likely to smoke than female adolescents in Egypt. The likelihood of adolescents' smoking in Egypt was significantly associated with age; low educational level of fathers; having no weekly pocket of money; poor self-confidence to refuse friends' smoking offers; absence of restriction on selling cigarettes to adolescents near their schools; and observing teachers' smoking inside schools. Whereas accessing information, through schools, about smoking consequences prevents adolescents' smoking. Adolescence is critical period for experimenting and continue smoking. The study identified some personal, parenteral, and school related factors that influence adolescents' smoking in Egypt. These factors should be considered in designing smoking prevention program that targets adolescents.

ARTICLE HISTORY
Received 27 August 2021
Accepted 5 October 2021

KEYWORDS
Smoking; adolescents; predictors; risk; Egypt; Arab; LMIC

Introduction

Globally, tobacco is the main cause of preventable morbidity and premature death (WHO, 2019). Smoking increases the risk of non-communicable diseases (NCD) (WHO, 2013) which cause 68% of the global deaths; 82% of these deaths happen in Low- and Middle-Income Countries mainly before the age of 70 (WHO, 2014, 2019). NCDs cause 84.7% of all Egyptian deaths (WHO, 2016). One in four Egyptian adults dies prematurely (between 30 and 70 years old) from tobacco-related NCDs (WHO, 2014, 2019). Egyptian adults mainly use smoked tobacco, manufactured cigarettes followed by Shisha (water-pipe) (MOHP, WHO & CDC, 2009). There is a noticeable increase in E-cigarette smoking in Egypt, but its national prevalence was not documented in the available literature. (ABO-ELKHEIR & SOBH, 2016; Dwedar et al., 2019; LUNDBÄCK et al., 2016). Egyptian smokers spend 23.1% of their family income on smoking, the poor smokers spend at least 10% of their income on smoking(SALEH et al., 2009). Egyptians' smoking rate increases annually more than the population growth rate (8–9% versus 2%) (SALEH et al., 2009). The last Global Adults Tobacco Survey revealed that the rate of tobacco use in Egypt is the highest in the Arab world and the second highest rate in the MiddleEast (ASMA et al., 2015), as 23.8% and 19.7% of Egyptian adults had ever tried tobacco (MOHP, WHO &

CONTACT Maryam Ba-Break M.M.Ba-Break@leeds.ac.uk

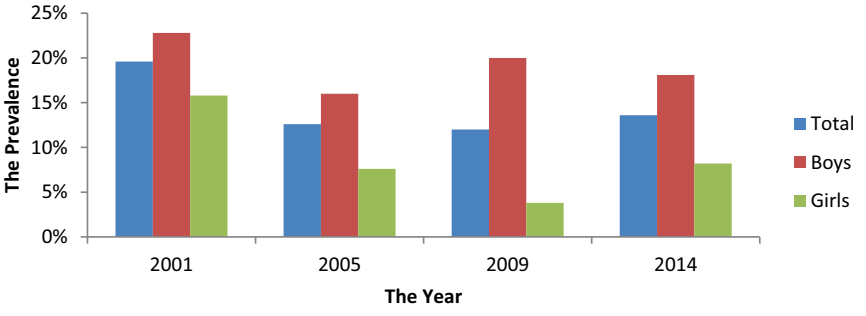

Figure 1. Prevalence of current use of tobacco among Egyptian adolescents aged 13–15, by gender, 2001–2014. **Source**: (DOUS, 2001; WHO & CDC, 2005, 2014b; WHO & CDC & CDC, 2009)

CDC, 2009) or currently use tobacco (ASMA et al., 2015) respectively. This smoking epidemic should be prevented by targeting adolescents because most Egyptians start smoking at adolescence age (MOHP, WHO & CDC, 2009).

Smoking among Egyptian adolescents

National surveys reveal that adolescents' smoking (cigarettes and Shisha) is a public health problem in Egypt (MOHP, 2015; WHO & CDC, 2014b). One in three (31.3%) adolescents, aged 13–15, had ever-used tobacco (smoked or smokeless) and one in seven (13.6%) currently use tobacco products (WHO & CDC, 2014b). Current tobacco use by adolescents, aged 13–15, has increased after a decline between 2001 and 2009, see Figure 1.

Egyptian adolescents mainly use smoked tobacco as 74.3% of current tobacco users smoke either cigarettes or Shisha (WHO & CDC, 2014b). Therefore, this study focuses on analysing the predictors of using smoked tobacco among adolescents in Egypt. Manufactured cigarettes were the most popular among adolescents until 2009, used by 74.2% of current smokers (WHO & CDC, 2005, WHO; CDC, 2009) but then became less popular than other smoked tobacco (mainly Shisha), used by 35% (versus 42%) (WHO & CDC, 2014b). Although Shisha smoking was previously a male adults behaviour (Elawa et al., 2010), Shisha venues catering for youths consciously increase in Egypt and most Shisha smokers usually smoke cigarettes too (El-gilany et al., 2008). Over half of smoker adolescents are heavy and frequent smokers, therefore exposed to serious risks (WHO & CDC, 2014b).

Smoker adolescents are at risk of becoming smoker adults, nicotine dependants, substances-abusers and developing physical and psychological complications of NCDs (Tucker et al., 2003; VIANNA et al., 2008; Williams & SANDLER, 2001). However, these complications take years before been recognized (WHO, 2013). To avoid burdening the Egyptian health system, adolescents' smoking should be prevented as Egyptians start smoking at adolescence age (MOHP, WHO & CDC, 2009) and smoking rates increase with age (ASMA et al., 2015).

Few studies searched predictors of adolescents' smoking at specific sites of Egypt but there is limited evidence on these predictors at the national level. Understanding these predictors at the national level is required in order to design effective national interventions for preventing adolescents' smoking, as this is a key step in designing effective behaviour change interventions (MICHIE et al., 2014). **This study aimed** to identify factors that influence smoking among adolescents in Egypt using the recent national GYTS data (WHO & CDC, 2014b). Due to the limitation of funds, the last GYTS was conducted in 2014 and there was no opportunity to conduct another recent national survey to achieve the aim of this study.

Methods

The GYTS is a global standard cross-sectional school-based survey that aims at monitoring tobacco use among adolescents across countries over time (CDC, 2009). To allow this comparison standard methods (questionnaire, sampling techniques, indicators, data collection and processing methods) are used in all GYTS (CDC, 2016).

Sampling

A two-stage cluster sample design was used to select a national representative sample of 2,471 pupils aged 13–15 years enrolled in the first, second and third grades at preparatory schools across all the Egyptian governorates (WHO & CDC, 2014b). Schools are selected in the first stage, the sampling frame in each governorate includes all preparatory schools in this governorate but the probability of selecting schools was proportional to school enrolment size. Then classes are randomly selected in the second sampling stage. All pupils in the selected classes who attended schools in the survey day were eligible to participate in this survey but their participation was voluntary (WHO & CDC, 2014a). The response rate was 98.2% (WHO & CDC, 2014b).

Data collection instrument

The GYTS core questionnaire was adapted, translated, and back translated, then piloted with pupils aged 13–18 years to check accuracy and pupils' comprehension of the questions. Participants filled this self-administered questionnaire which included questions about: tobacco use (smoked and smokeless); knowledge and attitudes about tobacco; exposure to smoking; availability and accessibility of tobacco products; receiving educational messages inside or outside schools about smoking consequences; and susceptibility to smoking (CDC, 2016). Pupil's responses were anonymized to ensure confidentiality.

Data analysis

The SPSS software package, version 16, was used to secondary analyse the 2014 GYTS data.

Logistic regression was used to identify the predictors of being ever or current smoker; odds ratios (OR) were reported with the corresponding 95% confidence intervals (CI). The findings of the OR are considered statistically significant at the $P < 0.05$ level if the 95% CI does not include the one. The predictors are considered as negative predictors if OR > one and considered as protective when OR < one (Armitage et al., 2008).

Smoking behaviour was described using two dependent variables: ever smoking and current smoking. These variables are defined according to the GYTS as follow: *'ever smokers* are those who have tried smoking at least once in their lifetime, even a puff or two' while '*current smokers* are those who have smoked at least once in the 30 days prior to surveys administration' (ASMA et al., 2015; WHO & CDC, 2014b). Smoking in this article refers to any form of smoking, as the GYTS was not disaggregated by the type of smoked tobacco to allow separating the predictors of Shisha and cigarettes smoking.

Various explanatory variables were considered in the analysis including: age; gender; parents' educational level; average weekly pocket of money; existence of age-restriction of purchasing tobacco; ability to purchase tobacco near to school; awareness of smoking consequences; beliefs or attitude towards tobacco use (e.g. attractiveness, difficulty to quit, harms stop immediately after quitting); observing teachers smoking in schools; discussing tobacco harms with relatives; susceptibility to use tobacco in next 12 months or if offered by best friend.

Ethical approval

Ethical approval for the project and licence to access and re-analyse the GYTS data were obtained in accordance with the ethical standards of the Helsinki Declaration (1964, 2008) of the World Medical Association.

Results

The GYTS data revealed that one third (31.3%) of, the included 2,141, adolescents had ever-used tobacco (smoked or smokeless) before the age of 15 years and 13.6% of them are current users of any tobacco products. Three quarters (74.3%) of adolescents who are current tobacco users smoke either cigarette or Shisha, the rest (25.7%) use either e-cigarettes or smokeless tobacco. The rate of smoking manufactured cigarette is slightly lower (35%) than Shisha smoking (42%) among current tobacco users. The available GYTS data did not distinguish those who smoke e-cigarettes, hand-rolled-cigarettes and those who smoke more than one type of tobacco products.

This study explored several factors in relations to ever and current smoking among Egyptian adolescents. According to Blum's framework (Blum et al., 2001), these factors are classified into factors related to individuals, parents, friends and the environment inside and around schools. Factors that showed (positive or negative) influence on adolescents' smoking in Egypt at each level are discussed below.

Factors related to individuals and their parents

Table 1 summarizes individual and parenteral factors that influence (ever and current) smoking by Egyptian adolescents. The analysis shows that the risk of experimenting smoking increases with age as adolescents aged 14 years are more likely to experiment smoking than those aged 13. Also, adolescents at the age of 15 are more likely to be current smokers compared with those aged 13 years. Males have significantly higher odds ratio compared to females for being ever and current cigarette smokers.

Adolescents whose fathers have lower educational levels have significantly higher odds ratio of experimenting smoking compared with those whose fathers are university educated. The opposite was observed in the association between fathers' educational level and the current smoking status of adolescents. Compared to adolescents whose mothers were illiterate, adolescents whose mothers have a higher educational level were significantly less likely to be ever or current smokers, see Table 1 . No significant gender difference was identified in the association between parents' education and adolescents' smoking.

The risk of experimenting smoking is inversely associated with the amount of weekly pocket money. For example, the odd ratio of ever smoking among adolescent who get more than 50 Egyptian bounds per week is lower than those who do not get any weekly pocket money at all. The odd ratio of ever and current smoking was higher among adolescents who discussed some negative consequences of smoking with their family members compared with those who did not.

Awareness and beliefs about smoking

Awareness of smoking harm to health reduces the likelihood of experimenting smoking by adolescents, see Table 1 . Adolescents who are not sure about smoking health consequences are less likely to be ever or current smokers compared with those who believe that smoking has no harms on health. Additionally, pupils who believe that smoking, even for a short period, is unsafe are less likely to be current smokers than those who believe that smoking for one or two years is safe.

Pupils who believe that smoking influences their attractiveness (positively or negatively) are more likely to experiment and continue smoking than those who believe that smoking doesn't influence their attractiveness. Moreover, pupils' belief that smoking makes them more comfortable in

Table 1. Individual and family related factors that influence adolescent smoking.

	Ever smoking		Current smoking	
Explanatory variables (independent)	Odds' ratio	Confidence interval	Odds' ratio	Confidence interval
Age				
13 years		**Reference category**		
14 years	2.632	2.596 – 2.668	0.802	0.760 – 0.845
15 years	1.893	1.867 – 1.918	4.756	4.545 – 4.976
Gender				
Female		**Reference category**		
Male	2.679	2.650 – 2.709	2.926	2.807 – 3.052
Fathers' education				
University		**Reference category**		
Illiterate	9.519	9.293 – 9.749	0.099	0.090 – 0.109
Read/ write/Primary/Preparatory	8.055	7.885–8.227	0.630	0.579 – 0.685
Secondary /diploma	2.518	2.472–2.565	0.311	0.290 – 0.334
Don't know	13.586	13.26–13.92	1.008	0.897 – 1.132
Mothers' education				
Illiterate		**Reference category**		
Read/ write/Primary/Preparatory	0.655	0.646 – 0.664	0.005	0.005 – 0.006
Secondary /diploma	0.792	0.778 – 0.807	0.211	0.196 – 0.227
University	0.144	0.140 – 0.149	0.136	0.118 – 0.157
Don't know	0.467	0.455 – 0.480	0.215	0.194–0.237
Having pocket money per week (Egyptian Pounds)				
I usually don't have any pocket money		**Reference category**		
Have money less than 5 pounds	2.646	2.575 – 2.720	0.081	0.074 – 0.089
Have 5 – 50 pounds	1.442	1.403–1.483	0.049	0.045 – 0.054
More than 50 pounds	0.539	0.518 – 0.560	0.454	0.411 – 0.502
Smoking consequences were ever discussed with family members				
No		**Reference category**		
Yes	1.312	1.297 – 1.327	4.665	4.483 – 4.85
Beliefs that smoking tobacco is harmful to health				
Definitely not		**Reference category**		
Not sure	0.104	0.101 – 0.106	0.014	0.013 – 0.015
Definitely yes	0.350	0.344 – 0.355	1.056	1.013 – 1.100
Beliefs that it is safe to smoke tobacco for only a year or two as long as you quit				
Definitely yes		**Reference category**		
Not sure	0.911	0.895 – 0.927	0.301	0.280 – 0.324
Definitely no	1.057	1.036–1.078	0.303	0.283 – 0.325
Do you think young people who smoke more or less attractive				
No difference		**Reference category**		
Less attractive	4.546	4.463 – 4.631	2.670	2.482 – 2.872
More attractive	1.477	1.457 – 1.497	1.275	1.212 – 1.342
Do you think tobacco make people more or less comfortable in celebrating parties				
No difference		**Reference category**		
Less comfortable	3.460	3.412 – 3.508	5.649	5.368 – 5.945
More comfortable	1.837	1.812 – 1.863	88.448	83.42–93.8
Beliefs that it is difficult to quit once one has started smoking				
Definitely no		**Reference category**		
Not sure	2.626	2.596 – 2.657	16.212	15.31 – 17.17
Definitely yes	0.749	0.734 – 0.764	2.748	2.537 – 2.977

celebrating parties increases their probability to experiment and continue smoking. Simultaneously, adolescents' beliefs that smoking makes people less comfortable in celebrating parties positively associated with ever and current cigarette smoking (OR = 3.5, CI = 3.4–3.5 and OR = 5.7, CI = 5.37–5.95 respectively).

Adolescents who believe that quitting smoking is difficult are significantly less likely to experiment smoking (OR = 0.75, CI = 0.73–0.76) but the odd ratio of current smoking is higher among them compared with those who believe that quitting smoking is possible (OR = 2.75, CI = 2.54–2.98).

Table 2. Adolescents' smoking and friends-related factors.

	Ever smoking		Current smoking	
Explanatory variables (independent)	Odds' ratio	Confidence interval	Odds' ratio	Confidence interval
If one of your best friends offered you tobacco product, would you use it?				
Definitely not		**Reference category**		
Not sure	2.726	2.682 – 2.770	28.578	26.025–30.273
Definitely yes	3.355	3.256 – 3.456	254.111	240.01 – 270.1
Do you think young people who smoke have more or less friends				
No difference		**Reference category**		
Less friends	0.931	0.919 – 0.944	3.111	2.937 – 3.295
More friends	0.279	0.275 – 0.284	2.593	2.444 – 2.751

Adolescents who never smoked but are unconfident about their ability to avoid smoking in the future are more likely to experiment smoking than those who are confident about their ability to avoid smoking in future even if they received free tobacco products.

Friends-related factors

Table 2 shows that adolescents who would accept smoking offers by their friends are at higher risk to experiment and continue smoking than those who mentioned that they will reject smoking offers by their friends. Additionally, lack of self-confidence to refuse smoking offers by friends increases the likelihood of experimenting and continue smoking. Pupils who believe that their smoking status doesn't affect number of their friends are more likely to try smoking than those who believe that smoking would influence their friends' number. However, pupils who believe that either smoking is a way to attract friends or smoking dis-attract friends are more likely to be current smokers than those who believe that their smoking status doesn't affect their friendships.

Environmental factors inside and around schools

Table 3 summarizes factors related the environment inside and around schools that influence adolescents' smoking. For example, pupils who daily observe their teachers smoke inside schools are four times more likely to experiment smoking (CI = 4.86–5.07) and 32 times more likely to be current smokers (CI = 29.29–34.93) than those who never observe teachers smoking inside schools.

Table 3. Schools-related factors and smoking by adolescent in Egypt.

	Ever smoking		Current smoking	
Explanatory variables (independent)	Odds' ratio	Confidence interval	Odds' ratio	Confidence interval
Were you taught in schools about smoking harms, during the past 12 months?				
No		**Reference category**		
Yes	0.923	0.912–0.934	0.366	0.351 – 0.382
I don't know	1.115	1.099 – 1.132	0.087	0.082 – 0.093
During school hours, how often you see your teacher smoke				
Never		**Reference category**		
Sometimes	3.696	3.617 – 3.777	1.228	1.11 – 1.36
About every day	4.963	4.862 – 5.067	31.98	29.29 – 34.93
Don't know	8.496	8.294 – 8.702	217.07	195.81 – 240.7
Can you purchase tobacco near your school				
No		**Reference category**		
Yes	2.410	2.370 – 2.452	52.694	49.199 – 56.44
I don't know	1.580	1.560 – 1.600	115.173	107.05 – 123.9
Did anyone refuse to sell cigarette because of the age in the past 30 days				
Yes, someone refused		**Reference category**		
No one refused	62.333	60.17 – 64.58	65.727	60.47 – 71.44
I didn't buy cigarette in the past 30 days	2.444	2.380 – 2.510	0.111	0.103 – 0.120

The occasional observation of teachers' smoking inside schools also increases the likelihood of pupils' experimentation of smoking three times compared with the absence of this observation inside schools (CI = 3.62–3.78). Pupils who were taught in schools the danger of smoking are less likely to be ever or current cigarette smokers.

The Odd-ratio of current smoking was 52.7 (CI = 49.199–56.437) among those who can easily purchase tobacco from shops closed to their schools compared with those who can't do that. Additionally, absence of restrictions on selling cigarette to adolescents was a significant predictor of ever and current cigarette smoking (OR = 62.3, CI = 60.17–64.58 and OR = 65.7, CI = 60.48–71.44 respectively).

Discussion

The used GYTS data is the best available national data to understand the influencers of adolescents' smoking in Egypt for the following reasons: **1)** although school-based surveys are limited to pupils, GYTS data represents majority of adolescents in Egypt because of the high (98%) regular school attendance rates (UNESCO, 2019). **2)** Although school-based survey findings only apply to pupils who present on survey days, the response rates was high (98.2%) in 2014 GYTS (WHO & CDC, 2014b), which limits biases attributable to non-response or absence. **3)** Specific test-retest results for similar tobacco-related questions were used to increase reliability and reduce biases caused by adolescents self-reporting of their smoking behaviour and attitude (Warren et al., 2008). **4)** The GYTS sample was weighted by a weighting factor that is applied to each pupil to adjust for non-response (by school, class, and student) and variation in the probability of selection at schools and class levels (WHO & CDC, 2014a). This weighting approach makes the survey sample nationally representative of all Egyptian pupils in preparatory schools (Armitage et al., 2008).

The findings show that the risk of experimenting smoking in Egypt increases with age and males are more likely to experiment and continue smoking than females. Other national surveys emphasized that smoking at adolescence ages markedly varies by gender in Egypt, see Figure 1(MOHP, 2015; WHO & CDC, 2014b). Although the current rate of tobacco use among girls is low (8.2%), it has been doubled since 2009, as it was 3.8% (WHO and CDC, 2009).

Ever smoking is inversely associated with fathers' educational level. However, the opposite was true in relation to mothers' education as adolescents of low educated mothers are less likely to experiment and continue smoking than those of university-educated mothers No significant gender difference was identified in the association between parents' education and adolescents' smoking. Data about family income, an important confounding factor of the association between parents' education and adolescents' smoking, was unavailable to be explored.

Having no weekly pocket of money seems to increase the risk of being current smoker while that the risk of experimenting smoking inversely associated with the amount of weekly pocket money. Limited data was available about confounding factors of this association such as the working status of adolescents, other sources of money and accessibility to tobacco products through their households, friends, and other sources. Other studies (El-gilany et al., 2008; GADALLA et al., 2003; ISLAM & Johnson, 2005) indicate that many Egyptian smokers in different ages commonly share cigarettes. This means that adolescents could share cigarettes with their friends if they don't have enough money to buy cigarettes for themselves. Studies conducted in Arabic and European contexts concluded that being dependants on friends increases the risk of adolescents' smoking (Al-damegh et al., 2004; BAHAJ et al., 2010; Harbour, 2011; MOHP, WHO & CDC, 2009; MORADI-LAKEH et al., 2010; WELLMAN et al., 2016).

Awareness of smoking consequences on health and addiction is more likely to protect adolescents from experiencing smoking whereas believing that smoking makes people more comfortable in celebration increases the likelihood to experiment and continue smoking among Egyptian adolescents. Similar findings were identified in other contexts (JABER et al., 2016; WELLMAN et al., 2016).

Adolescents who discussed smoking consequences with their parents or siblings are more likely to experiment smoking or be current smokers compared with those who did have this discussion. However, limited data was available about the smoking status of these family members, the times and situation of this discussion, and reasons for this discussion. For example, it was unclear if this discussion took place after recognizing adolescent's smoking or positive attitude towards smoking or it was a preventing advice and open discussion? The timing and contents of parents' discussion of smoking consequences with adolescents need to be explored in further studies in order to explain this finding.

Susceptibility to smoking, defined as inability to rule out smoking in the next 12 months (ASMA et al., 2015), increases the probability of (current and ever) smoking by Egyptian adolescents. This findings is also applicable to other contexts (WELLMAN et al., 2016).

The analysis showed that adolescents' beliefs that smoking would influence their friendships markedly increase their risk of maintaining (not experimenting) smoking. Other studies emphasizes that smoking initiation by Egyptian adolescents is markedly influenced by smoking of friends and parents and the influence of smoking by friends increases with age in Egypt (Harbour, 2011; ISLAM & Johnson, 2005) and other countries (JABER et al., 2016; Scalici & Schulz, 2014; WELLMAN et al., 2016).

The analysis revealed that either willing to accept smoking offers of friends or lack of self-confidence to refuse friends' smoking offers increase the risk of ever and current smoking among Egyptian adolescents. Evidence from other contexts also emphasizes the role of poor-self efficacy on adolescents' smoking (WELLMAN et al., 2016).

Smoking by adolescents is markedly influenced by the environment inside and around schools. Observing teachers' smoking inside schools was significantly associated with being ever or current smoker adolescents. Whereas pupils' accessibility to information on smoking consequences at schools protects them from experimenting and continue smoking. Moreover, pupils' ability to purchase cigarettes near their schools was significantly associated with experimenting and maintaining cigarette smoking among adolescents in Egypt (Harbour, 2011; ISLAM & Johnson, 2005) and other countries (JABER et al., 2016; Scalici & Schulz, 2014; WELLMAN et al., 2016).

Limitations and implications for future research

This study is limited by using self-administered questionnaire in the GYTS which may have caused over or underreporting of responses. Additionally, the GYTS data is cross-sectional which resects identifying causality and only allows exploring associations. A longitudinal study is needed for better identification of predictors of adolescents' smoking in Egypt.

It was impossible to differentiate the predictors of e-cigarettes and Shisha smoking from those of cigarettes smoking because the available GYTS data was not disaggregated by the type of smoked tobacco. There is an alarming growth of shisha smoking among Egyptian adolescents (KHEIRALLAH et al., 2016; WHO & CDC, 2014b, WHO; CDC, 2009). This urges the need for exploring the predictors of Shisha smoking by Egyptian adolescents and if these predictors vary by gender and are different from the predictors of cigarettes smoking. There is also a need to identify the national prevalence and predictors of e-cigarette smoking as its use is noticeably increasing in Egypt like other countries (ABO-ELKHEIR & SOBH, 2016; Dwedar et al., 2019; LUNDBÄCK et al., 2016). Although e-cigarettes has being marketed as safer alternatives to smoking, the evidence of its harms to lung and cardiovascular functions are increasing (DARABSEH et al., 2020; Magalhaes, 2021). Also there is growing evidence that e-cigarette use is associated with a high risk of subsequent cigarette smoking (East et al., 2019; MCCABE et al., 2018; SONEJI et al., 2017; TREUR et al., 2018). However, context-specific exploration of this association is needed as it may depend on local factors.

A qualitative study is needed to explore the timing and contents of parents' discussion of smoking consequences with adolescents and why those who received information from parents about smoking consequences are more likely to smoke than those who never discussed that with their parents. There is also a need to explore how adolescents' smoking behaviour is influenced by the smoking status of parents who provided information on smoking consequences.

Conclusion

This study demonstrated that the likelihood of adolescents' smoking in Egypt was significantly associated with age; low educational level of fathers (not mothers); having no weekly pocket of money; willing to accept smoking offers of friends or lack of self-confidence to refuse friends' smoking offers; absence of restriction on selling tobacco products to adolescents near their schools; and observing teachers' smoking inside school premises. Whereas improving pupils' accessibility to the information on smoking consequences at schools protect protects adolescents from smoking behaviour.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

: Self-funded.

ORCID

Maryam Ba-Break http://orcid.org/0000-0002-2961-9259

Authors' contributions

All authors conceived the study; MB designed the study protocol, obtained permission to access the data and obtained the data from the CDC; FM and DO conducted the analysis while MB and DO interpreted the data and drafted the manuscript. All authors critically revised the manuscript for intellectual content and advised on the publication process. All authors read and approved the final manuscript. MB is the guarantor of the paper.

References

ABO-ELKHEIR, O. I., & SOBH, E. (2016). Knowledge about electronic cigarettes and its perception: A community survey, Egypt. *Respiratory Research*, 17(1), 1–7. https://doi.org/10.1186/s12931-016-0365-0

Al-damegh, S. A., SALEH, M. A., AL-ALFI, M. A., & Al-hoqail, I. A. (2004). Cigarette smoking behavior among male secondary school students in the central region of Saudi Arabia. *Saudi Medical Journal*, 25 (2) , 215–219 https://europepmc.org/article/med/14968222 .

Armitage, P., Berry, G., & Matthews, J. N. S. (2008). *Statistical methods in medical research*. John Wiley & Sons.

ASMA, S., MACKAY, J., YANG SONG, S., ZHAO, L., Morton, J., & PALIPUDI, K. (2015). *Global Adult Tobacco Survey (GATS) Atlas* |. CDC Foundation.

BAHAJ, A. A., BAAMER, A. A., & BRIEK, A. S. (2010). Prevalence of tobacco use among young students in Yemen. *Journal of the Bahrain Medical Society*, 22 (1) , 5–8 http://www.jbms.org/22021171476.pdf .

Blum, R. W., MCNEELY, C., NONNEMAKER, J., FISCHHOFF, B., Nightingale, E., & IANNOTTA, J. (2001). . *Adolescent Risk and Vulnerability: Concepts and Measurement* (Washington, United States: National Academies Press), 50–72 NCJ Number 191232 .

CDC. (2009). *The GTSS atlas: part three: Global youth tobacco survey* (USA: Centers for Disease Control and Prevention (CDC)).

CDC. 2016. *global youth tobacco survey (gyts), an overview. global tobacco surveillance system data (GTSSData) [Online]*. Available: https://nccd.cdc.gov/gtssdata/Ancillary/Documentation.aspx?SUID=1&DOCT=1 [Accessed]

DARABSEH, M. Z., SELFE, J., Morse, C. I., & DEGENS, H. (2020). Is vaping better than smoking for cardiorespiratory and muscle function? *Multidisciplinary Respiratory Medicine* 1 , 15 doi:10.4081/mrm.2020.674.

DOUS, N. M. (2001). *Report of Global Youth Tobacco Survey*. The National Comprehensive Tobacco Control Program, Ministry of Health and Population.

Dwedar, I., Ruby, D., & MOSTAFA, A. (2019). A survey exploring knowledge and beliefs about electronic cigarettes between health care providers and the general population in Egypt. *International Journal of Chronic Obstructive Pulmonary Disease*, 14, 1943. https://doi.org/10.2147/COPD.S214389

East, K. A., HITCHMAN, S. C., MCNEILL, A., Thrasher, J. F., & Hammond, D. (2019). Social norms towards smoking and vaping and associations with product use among youth in England, Canada, and the US. *Drug and Alcohol Dependence*, 205, 107635. https://doi.org/10.1016/j.drugalcdep.2019.107635

El-gilany, A.-H., BADAWI, K. A., & El-fedawy, S. A. (2008). Tobacco smoking among adolescent students in Mansoura, Egypt. *Paediatricsme*, 13 3 , 70–78 https://www.researchgate.net/profile/Abdel-Hady-El-Gilany-2/publication/265847290_Tobacco_smoking_among_adolescent_students_in_Mansoura_Egypt/links/541dd98f0cf203f155c04468/Tobacco-smoking-among-adolescent-students-in-Mansoura-Egypt.pdf .

Elawa, F., Warren, C. W., & Jones, ,. N. R. (2010). Changes in tobacco use among 13-15-year-olds between 1999 and 2007: Findings from the Eastern Mediterranean region. *Eastern Mediterranean Health Journal*, 16(3), 266–273. https://doi.org/10.26719/2010.16.3.266

GADALLA, S., ABOUL-FOTOUH, A., El-setouhy, M., Mikhail, N., ABDEL-AZIZ, F., Mohamed, M. K., KAMAL AEL, A., & Israel, E. (2003). Prevalence of smoking among rural secondary school students in Qualyobia governorate. *Journal of the Egyptian Society of Parasitology*, 33, 1031–1050.

Harbour, C. (2011). Smoking and normative influence among Egyptian youth: A review of the literature. *Eastern Mediterranean Health Journal*, 17(4), 349. https://doi.org/10.26719/2011.17.4.349

ISLAM, S. M., & Johnson, C. A. (2005). Influence of known psychosocial smoking risk factors on Egyptian adolescents' cigarette smoking behavior. *Health Promotion International*, 20(2), 135–145. https://doi.org/10.1093/heapro/dah604

JABER, R., MZAYEK, F., MADHIVANAN, P., KHADER, Y., & MAZIAK, W. (2016). Predictors of cigarette smoking progression among a school-based sample of adolescents in Irbid, Jordan: A longitudinal study (2008-2011). *Nicotine & Tobacco Research*, 18(4), 403–409. https://doi.org/10.1093/ntr/ntv100

KHEIRALLAH, K. A., Alsulaiman, J. W., Mohammad, H. A., ALZYOUD, S., VEERANKI, S. P., & Ward, K. D. (2016). Waterpipe tobacco smoking among arab youth; a cross-Country study. *Ethnicity & Disease*, 26(1), 107–112. https://doi.org/10.18865/ed.26.1.107

LUNDBÄCK, B., KATSAOUNOU, P., & LÖTVALL, J. (2016). The up-rise in e-cigarette use–friend or foe? *Respiratory Research*, 17(1), 52. https://doi.org/10.1186/s12931-016-0371-2

Magalhaes, M. (2021). Vaping restrictions: Is priority to the young justified? *Nicotine and Tobacco Research*, 23(1), 32–35. https://doi.org/10.1093/ntr/ntaa175

MCCABE, S. E., West, B. T., & MCCABE, V. V. (2018). Associations between early onset of e-cigarette use and cigarette smoking and other substance use among US adolescents: A national study. *Nicotine and Tobacco Research*, 20(8), 923–930. https://doi.org/10.1093/ntr/ntx231

MICHIE, S., Atkins, L., & West, R. (2014). *The behaviour change wheel: A guide to designing interventions*. Silverback Publishing.

MOHP, WHO & CDC. (2009). *Global Adult Tobacco Survey (GATS): Egypt country report*. World Health Organization Regional office for the Eastern Mediterranean.

MOHP. (2015) . *Egypt demographic and health survey Egypt: Ministry of Health and Population, El-Zanaty and associates*. The DHS Program, the United States Agency for International Development (USAID).

MORADI-LAKEH, M., BCHERAOUI, E. L., TUFFAHA, C., DAOUD, M., Al Saeedi, F., Basulaiman, M., MEMISH, M., ALMAZROA, Z. A., AL RABEEAH, A. A., M. A., & MOKDAD, A. H. (2010). Tobacco consumption in the Kingdom of Saudi Arabia: Findings from a national survey. *BMC Public Health*, 15(1), 611. https://doi.org/10.1186/s12889-015-1902-3

SALEH, A. S. E., HANAFY, K., & CHALOUPKA, F. J. 2009. Economics of Tobacco Taxation in Egypt.

Scalici, F., & Schulz, P. J. (2014). Influence of perceived parent and peer endorsement on adolescent smoking intentions: Parents have more say, but their influence wanes as kids get older. *PLoS ONE [Electronic Resource]*, 9(7), e101275. https://doi.org/10.1371/journal.pone.0101275

SONEJI, S., Barrington-trimis, J. L., Wills, T. A., LEVENTHAL, A. M., UNGER, J. B., Gibson, L. A., YANG, J., PRIMACK, B. A., Andrews, J. A., & MIECH, R. A. (2017). Association between initial use of e-cigarettes and subsequent cigarette smoking among adolescents and young adults: A systematic review and meta-analysis. *JAMA Pediatrics*, 171(8), 788–797. https://doi.org/10.1001/jamapediatrics.2017.1488

TREUR, J. L., ROZEMA, A. D., MATHIJSSEN, J. J., VAN OERS, H., & VINK, J. M. (2018). E-cigarette and waterpipe use in two adolescent cohorts: Cross-sectional and longitudinal associations with conventional cigarette smoking. *European Journal of Epidemiology*, 33(3), 323–334. https://doi.org/10.1007/s10654-017-0345-9

Tucker, J. S., Ellickson, P. L., & Klein, D. J. (2003). Predictors of the transition to regular smoking during adolescence and young adulthood. *Journal of Adolescent Health*, 32(4), 314–324. https://doi.org/10.1016/S1054-139X(02)00709-7

UNESCO. 2019 *World Development Indicators: Participation in education, Egypt [Online]*. United Nations Educational, Scientific and Cultural Organization. Available: http://wdi.worldbank.org/table/2.11 [Accessed 30 September. 2021]

VIANNA, E. O., Gutierrez, M. R. P., BARBIERI, M. A., CALDEIRA, R. D., Bettiol, H., & Silva, A. A. M. D. (2008). Respiratory effects of tobacco smoking among young adults. *American Journal of the Medical Sciences*, 336(1), 44–49. https://doi.org/10.1097/MAJ.0b013e31815c3b47

Warren, C. W., Jones, N. R., PERUGA, A., CHAUVIN, J., Baptiste, J. P., Costa De Silva, V., EL AWA, F., TSOUROS, A., RAHMAN, K., FISHBURN, B., Bettcher, D., & ASMA, W., & S., CENTERS FOR DISEASE, C. & PREVENTION. (2008). Global youth tobacco surveillance, 2000-2007. *Morbidity & Mortality Weekly Report. Surveillance Summaries*, 57, 1–28.

WELLMAN, R. J., DUGAS, E. N., Dutczak, H., O'loughlin, E. K., DATTA, G. D., LAUZON, B., & O'loughlin, J. (2016). Predictors of the onset of cigarette smoking: A systematic review of longitudinal population-based studies in youth. *American Journal of Preventive Medicine*, 51(5), 767–778. https://doi.org/10.1016/j.amepre.2016.04.003

WHO & CDC. (2005). *Global Youth Tobacco Survey (GYTS): Fact sheet Egypt*. World Health Organization Regional office for the Eastern Mediterranean.

WHO & CDC. (2014a). *Egypt, global youth tobacco survey: Sample description and weighting procedures*. World Health Organization Regional office for the Eastern Mediterranean.

WHO & CDC. (2014b). *Global youth tobacco survey: Fact sheet egypt*. World Health Organization Regional office for the Eastern Mediterranean.

WHO & CDC. 2009. *Global youth tobacco survey: Egypt Fact sheet*. CDC ed. Egypt World Health Organization Regional office for the Eastern Mediterranean.

WHO. (2013). *Global action plan for the prevention and control of noncommunicable diseases 2013-2020*. World Health Organization.

WHO. (2014) . *Global status report on noncommunicable diseases World Health Organization*. Switzerland.

WHO. (2016). *Health profile, Egypt*. World Health Organization, Regional Office for the Eastern Mediterranean.

WHO. (2019). *Global health estimates, summary tables: Estimated deaths by cause, age and sex 2000-2012*. Switzerland World Health Organization.

Williams, M. D., & SANDLER, A. B. (2001). The epidemiology of lung cancer. *Cancer Treatment and Research*, 105 1 , 31–52 https://doi.org/10.1378/chest.123.1_suppl.21S.