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Prevalence and Potential Factors Associated with Tobacco Consumption in Schooled Adolescents*

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Prevalence and Potential Factors Associated with Tobacco Consumption in Schooled Adolescents*

Theme: Promotion and prevention.

Contribution to discipline: The findings of this research are extremely important in the public health field as they demonstrate the frequency and distribution of a public health event, such as teen smoking. In recent years, some clear changes have occurred in the consumption pattern reported, which are reflected in the regular use of new tobacco products in the Colombian market (e-cigarette) and a greater smoking incidence in women. Those changes require strengthening prevention and regulation strategies on the distribution of devises such as e-cigarettes.

ABSTRACT

Objective: This study estimates the prevalence in tobacco consumption and the associated factors in adolescents at official educational institutions in the municipality of Palmira. **Methods:** This was a crosss-sectional analysis with an analytical component, including 205 high school students from six official schools. The analysis was performed through the SPSS statistics software version 24. Qualitative variables were expressed as ratios with their corrsponding 95 % confidence intervals (CI). Quantitative variables were expressed as central tendency and dispersion measures, depending on the distribution of the variable. Finally, an odds ratio was calculated for the associated factors with a 95 % CI and the binary logistic regression model statistical model was used to adjust the variables. **Results:** The tobacco consumption's overall prevalence was 38.5%, CI 95 % (31.6–45.4 %); e-cigarette, 20 %, 95 % CI (14.2–25.7 %); cigarette, 18.5 %, 95 % CI (12.9–24.1 %) and hookah, 17.9 %, 95 % CI (12.1–23 %), with a greater incidence in women than men. The resulting associated

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factors were age (OR 3.17, CI 95 % [1.48–6.79]), a partner who smokes (OR 2.51, 95 % CI (1.36–4.63 %), friends who smoke (OR 7.0, 95 % CI [3.4–14.5]), and the possibility of buying individual cigarettes instead of a pack (OR 2.60, 95 % CI (1.26–5.3). **Conclusions:** Smoking habit's overall prevalence is higher than the one reported in adolescents. Female subjects reported greater and more frequent consumption of e-cigarettes.

KEYWORDS (Source: DeCS)

Smoking; adolescents; risk factors; tobacco; electronic nicotine release systems; Epidemiology.

*Prevalencia y posibles factores asociados al consumo tabáquico en adolescentes escolarizados**

RESUMEN

Objetivo: estimar la prevalencia del consumo de tabaco y los factores asociados a esta práctica en adolecentes de instituciones educativas oficiales del municipio de Palmira. **Métodos:** estudio transversal con un componente analítico, que incluyó 205 estudiantes de bachillerato de seis colegios oficiales. El análisis se realizó con el programa estadístico SPSS versión 24. Las variables cualitativas se expresaron como proporciones, con sus respectivos intervalos de confianza (IC) al 95 %; y las variables cuantitativas como medidas de tendencia central y dispersión, según la distribución de la variable. Para los factores asociados, se calcularon *Odds ratio* con su IC al 95 %, y el ajuste de variables se realizó a través de regresión logística binaria. **Resultados:** la prevalencia global del consumo tabáquico fue del 38.5 %, IC 95 % (31.6-45.4 %); cigarrillo electrónico, del 20 %, IC 95 % (14.2-25.7 %); cigarrillo, del 18.5 %, IC 95 % (12.9-24.1 %); y narguile, del 17.9 %, IC 95 % (12.1-23 %), con más frecuencia en mujeres que en hombres. Los factores asociados fueron la edad (OR 3.17, IC 95 % [1.48-6.79]), tener novio que consuma tabaco (OR 2.51, IC 95 % (1.36-4.63 %), estar rodeado de amigos que fumen (OR 7.0, IC 95 % [3.4 -14.5]) y comprar cigarrillos sueltos (OR 2.60, IC 95 % (1.26-5.3). **Conclusión:** la prevalencia global del hábito tabáquico es superior a la reportada en adolescentes, mayor en el sexo femenino, con mayor frecuencia de consumo de cigarrillos electrónicos. Los factores asociados fueron la edad, tener novio o amigos que consuman tabaco y la posibilidad de comprar cigarrillos sueltos.

PALABRAS CLAVE (Fuente: DeCS)

Tabaquismo; adolescentes; factores de riesgo; tabaco; sistemas electronicos de liberación de nicotina; epidemiología.

* Artículo producto de un proyecto financiado por la Universidad Santiago de Cali, Colombia; proyecto número 450-62118-215.

*Prevalência e possíveis fatores associados ao consumo de tabaco em adolescentes escolarizados**

RESUMO

Objetivo: estimar a prevalência do consumo de tabaco e os fatores associados a esse hábito em adolescentes de instituições educativas oficiais do município de Palmira, Colômbia. **Métodos:** estudo transversal com um componente analítico, que incluiu 205 estudantes do ensino médio de seis colégios oficiais. A análise foi realizada com o programa estadístico SPSS versão 24. As variáveis qualitativas foram expressas como proporções, com seus respectivos intervalos de confiança (IC) a 95 %; as variáveis quantitativas como medidas de tendência central e dispersão, segundo a distribuição da variável. Para os fatores associados, foram calculados Odds ratio com seu IC a 95 %, e o ajuste de variáveis foi realizado por meio de regressão logística binária. **Resultados:** a prevalência global do consumo de tabaco foi de 38,5 %, IC 95 % (31,6-45,4 %); cigarro eletrônico, de 20 %, IC 95 % (14,2-25,7 %); cigarro, de 18,5 %, IC 95 % (12,9-24,1 %); narguilé, de 17,9 %, IC 95 % (12,1-23 %), com mais frequência em mulheres do que em homens. Os fatores associados foram a idade (OR 3,17, IC 95 % [1,48-6,79]), ter parceiro(a) que consuma tabaco (OR 2,51, IC 95 % (1,36-4,63 %), estar rodeado(a) de amigos que fumam (OR 7,0, IC 95 % [3,4 -14,5]) e comprar cigarro solto (OR 2,60, IC 95 % (1.26-5.3). **Conclusões:** a prevalência global do hábito tabágico é superior à relatada em adolescentes, maior no sexo feminino, com mais frequência de consumo de cigarros eletrônicos. Os fatores associados foram a idade, ter parceiro(a) ou amigos que consumam tabaco e a possibilidade de comprar cigarros soltos.

PALAVRAS-CHAVE (Fonte: DeCS)

Tabagismo; adolescentes; fatores de risco; tabaco; sistemas eletrônicos de liberação de nicotina; epidemiologia.

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Introduction

According to reports from the World Health Organization (WHO), tobacco consumption is a world-class problem. The mortality associated with this product's use is seven million people per year, of whom 86 % are direct consumers, and about 13 % are passive smokers. Although until a few years ago tobacco was only regularly consumed by adults, most consumers currently start smoking during their teenage years. Today, more than 150 million adolescents worldwide consume tobacco, and surprisingly, this number seems to be increasing in some countries despite countless public health interventions (1).

In fact, different authors have discussed this issue that does not distinguish between developed and developing countries (2-3).

Sinha et al. (4), through a study conducted in a group of people in the Southeast Asian region, reported that the prevalence of tobacco consumption in students aged 13–15 years ranges from 5.9 to 56.5 %. It is important to emphasize that the reported prevalence was higher in men than in women, and several other smoking products reported higher consumption than cigarrettes.

In the United States, the prevalence of tobacco consumption in adolescents ranges from 9 to 25 %. According to different reports, the most frequently used products are e-cigarettes (13.4 %), hookah (9.4 %), and cigarretes (9.2 %), with 40 % using more than one product (5-6).

In Colombia, a study conducted by Pardo et al. estimated the prevalence of smoking in adolescents in five major cities of the country (Bogotá, Bucaramanga, Cali, Manizales, and Valledupar). According to the results, the frequency of cigarette consumption ranged from 7.4 to 34.1 %, the risk of non-smokers starting smoking was between 12.3 and 32%, and the cities with greater smoking frequency were Manizales (68.8 %), Bogotá (57.1 %), and Cali (55 %) (7). Currently, according to data from the Colombian Ministry of Health and Social Protection, the prevalence of smoking is 26.8 % (8).

Regarding the starting age of consumption and the associated factors, several studies denote that adolescents begin experimenting with cigarettes and other tobacco products between the ages of 10 and 14. The usual risk factors are: being at least 13 years old, the academic level of the parents, having parents who are smokers and being exposed to advertising related to these products in different scenarios (9-13).

This reasearch aimed to estimate the prevalence of smoking and the potential factros associated in teenage students in the city of Palmira in 2018. The need for this research arose from factors such as new social dynamics, the entry of new tobacco products into the Colombian market and the fact that teenage smoking is of public health interest, in addition to other contextual elements that were considered.

Methods

Design and Participants

A cross-sectional study was conducted with an analytical component, which included adolescents between the ages of 11 and 19, studying at six different schools in the city of Palmira, Colombia. The total student population for this age range at these six schools was 3566, from the sixth to the eleventh grade. To calculate our sample size, we considered how representative the results were, using a formula to estimate ratios with a correction factor, based on the following assumptions: a 95 % confidence level, 5 % permissible standard error, and a expected ratio of 17 %, with a *n* of 205 students. A stratified probabilistic sampling was conducted to select participants.

To collect the information, four previously trained people attended educational institutions for a month in the first semester of 2018. Then, they implemented the Global Youth Tobacco Survey, whose original questions were drafted as per the WHO and Unicef's "Tobacco-Free" initiative, revised and adapted in Colombia in 2001 by the National Institute of Cancer Research (14). Before implementing the survey, the project was socialized and research was conducted regarding the willingness of each student to participate, which was expressed by both the students and their legal guardians.

This study considered *sociodemographic variables,* such as age, gender, academic degree, religion, and socioeconomic status and level, as well as the academic level of their parents. *Variables related to tobacco consumption* (cigarette, hookah, and e-cigarette), such as starting age of consumption, number of cigarettes smoked, place where products are obtained, and usual place of consumption. *Social factors* such as being in a relationship, pos-

sibility of accessing tobacco products, and having smoking parents or friends. Preventive and perception measures for the risk of consumption, such as the opinion expressed by their parents about the consumption of tobacco, perception of the difficulty of quitting, belief that smoking increases the circle of friends, exposure to tobacco advertising, and perception of its influence on the decision to smoke.

Statistical analysis

The data analysis was performed using the statistical package SPSS, version 24. Initially, an exploratory study of the variables was made to identify omitted and extreme values. The Kolmogorov Smirnov test, with Lilliefors correction, was used for standardizing the variables and determining the use of parametric or non-parametric tests. Quantitative variables were expressed through measures of central tendency with their corresponding measures of dispersion. Additionally, qualitative variables were described in frequency or percentages. To establish the raw association between independent variables and tobacco consumption, odd ratios were estimated with their corresponding 95 % confidence intervals (CI). Finally, a binary logistic regression was conducted with the "Wald Test," using the variables that presented a statistical significance < 0.20 in the bivariate analysis.

Ethical aspects

The research followed the ethical guidelines of Resolution 8430 from the Ministry of Health of Colombia and the Declaration of Helsinki. The protocol had the ethical endorsement of the Santiago de Cali University, the authorization by the Ministry of Education of the city of Palmira, and the approval of the institutions involved. All participants filled out the informed consent or approval and their data was treated confidentially.

Results

In total, 205 teenage school students were assessed, of which 58 % were female, with an average age of 15 years (SD: +/− 1.8). The majority (60 %), at the time of the study, were between ninth and eleventh grades and their socioeconomic status was Level 2 (48 %). From a spiritual perspective, 34 % practiced a religion. As for the educational level of their parents, the most frequent was elementary school (46 % of mothers and 32 % of fathers) (Table 1).

Table 1. Sociodemographic characteristics of school adolescents in the city of Palmira in 2018

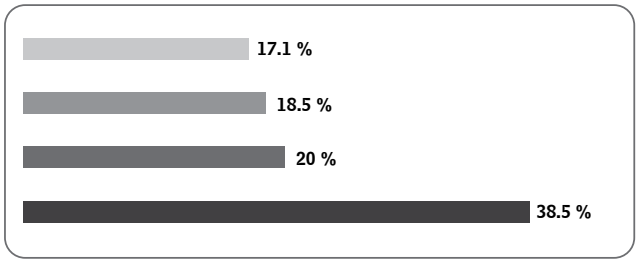
	No	%
Gender		
Male	118	58
Female	87	42
Socioeconomic Level		
1	54	26
2	99	48
3	49	24
4	3	2
Religious		
Yes	70	34
No	135	66
School Grade		
Sixth	33	16
Seventh	28	14
Eight	22	10
Ninth	34	17
Tenth	45	22
Eleventh	43	21
Mother's Academic Level		
None	1	1
Does not answer	23	11
Elementary school	95	46
Secondary school	53	26
Technical education	15	7
Undergraduate	17	8
Graduate	1	1
Father's Academic Level		
None	24	12
Does not answer	50	24
Elementary school	40	20
Secondary school	65	32

	No	%
Technical education	11	5
Undergraduate	15	7
Graduate	0	0

Source: Own elaboration.

Regarding the smoking habit, it was found that the total prevalence of smoking was 38.5 %. The most used product was the e-cigarette (20 %), followed by conventional cigarettes (18.5 %) and hookahs (17.1 %) (Figure 1). After analyzing tobacco consumption by gender, it was observed that this is higher in women (47 %) than in men (32 %).

Figure 1. Prevalence of tobacco product consumption in schooled adolescents in the city of Palmira in 2018



Source: Own elaboration.

When considering the consumption characteristics of each smoking product, it was observed that the average starting age for cigarette consumption was 13 years (SD: +/- 5.5). Majrity of the smoking adolescents (55 %) smoke an average of nine cigarettes (SD: +/6), to a greater extent, 1–3 days a month. Regarding e-cigarettes, women consume it more frequently (80 %), and the starting trend for consumption is 15 years, similar to what happens with the hookah. Generally, the use of tobacco products in this age range occurs in public places or where they normally meet with their closest circle of friends (37 and 23 %, respectively).

After estimating the raw odd ratio of the sociodemographic, family, and social variables, it was found that those associated with smoking were female (0R = 1.88 95 % CI: 1.06–3.32 P = 0.03), from low socioeconomic level (0R = 2.72 95 % CI: 1.32–5.6 P = 0.008), with a partner who consumes tobacco (0R = 2.51 95 % CI: 1.36–4.63 P = 0.003), with the possibility of buying individual cigarettes (0R = 2.86 95 % CI: 1.58–5.1 P = 0.000), with smoking friends (0R = 6.96 95 % CI: 3.69–13.12 P = 0.00), and with a belief that it is difficult to quit once you start (0R = 2.36 IC 95 %: 1.30–4.28 P = 0.006). Conversely, the protective factors identified were being a man, belonging to a high socioeconomic level, and believing that tobacco-related advertising may affect their decision to smoke (Table 2).

Finally, the logistic regression model that best fits X^2 is presented as follows: 58.57 P = 0.000. The variables independently associated with smoking are age (between 11 and 15 years. OR: 3.17 95 % CI: 1.48–6.79 P = 0.003), being in a relationship with someone who smokes (OR: 3.09 95 % CI: 1.48–6.4 P = 0.003), the possibility of buying individual cigarettes (OR: 2.60 95 % CI: 1.26–5.3 P = 0.01), and being surrounded by smoking friends (OR: 7.0 95 % CI: 3.4–14.5 P = 0.000) (Table 3).

Table 2. Smoking and sociodemographic, family, and risk perception variables in schooled adolescents in the city of Palmira in 2018

	OR	95 % CI		P
		LCL	UCL	
Gender				
Female	1.88	1.06	3.32	0.03
Age				
11–15 Years	1.18	0.60	2.05	0.06
School Grade				
9–11	1.19	0.67	2.11	0.66
Religious				
No	1.75	0.95	3.2	0.07
Socioeconomic Level				
1–2	2.72	1.32	5.6	0.008
Education Level				
Mother	1.62	0.73	3.60	0.23
Father	0.54	0.21	1.36	0.19

Social, Family Factors, and Risk Perception				
Boyfriend or girlfriend smokes	2.51	1.36	4.63	0.003
Possibility of buying individual cigarettes	2.86	1.58	5.1	0.007
Friends that smoke	6.96	3.69	13.12	0.000
Friends offering cigarette	7.1	2.27	22.4	0.000
Family perception of consuming tobacco	0.44	0.19	1.01	0.08
Believing that it is difficult to quit once you start	2.36	1.30	4.28	0.006
Believe that women who smoke have more friends	0.23	0.10	0.53	0.001
Believe that men who smoke have more friends	1.02	0.57	1.83	0.95
He/she believes that tobacco advertising can influence his/her decision to consume it	0.52	0.29	0.93	0.02

UCL: upper confidence limit; LCL: lower confidence limit.

Source: Own elaboration.

Table 3. Regression model of the variables associated with tobacco consumption in schooled adolescents from official institutions in Palmira, Valle, in 2018

	P	OR	95 % CI	
			LCL	UCL
Age	0.003	3.1	1.48	6.79
Boyfriend or girlfriend smokes	0.003	3.0	1.48	6.46
Possibility of buying individual cigarettes	0.010	2.6	1.26	5.39
Friends smoke	0.000	7.0	3.44	14.55

Source: Own elaboration.

Discussion

The consumption of smoking products continues being a public health issue from which adolescents are not exempt. In this study, a global prevalence of tobacco consumption of 38.5 %, 95 % CI (31.6–45.4 %) was found; the most commonly used products are e-cigarettes (20 %, 95 % CI; 14.2–25.7 %) andconventional cigarettes (18.5 %, 95 % CI (14.2–25.7 %). The aforementioned information is interesting considering that the common use of these products is associated with the onset of chronic diseases and constitutes a main cause of premature death (15).

The behavior found is closely related to what was reported in the study by Mohammed et al., wherein a group of 695 Saudi adolescents between 11 and 16 years reported a prevalence of 39.6 %, but it is far from the consumption frequency of smoking products reported in Latin American countries and cities such as Mexico that identified a prevalence of 24 %; Brazil (20.9 %); Argentina (22 %); Paraguay (12.9 %); and Venezuela (9.4 %) in teens (3, 16-18).

In Colombia, according to the data from the Ministry of Health and Social Protection gathered in main cities, the frequency of tobacco consumption is 28.6 %, with a higher prevalence in men (28.8 %) than in women (24.6 %), and a greater frequency in students from public educational institutions than private (27.8 and 20.4 %, respectively). When performing the analysis by city, Barranquilla (20.8 %) showed the lowest prevalence, while Medellín reported the highest (28.3 %). Both results are far from the numbers reported in this research (8).

The frequency of e-cigarette consumption reported in this study proves an increased tendency in the use of these devices. This behavior happens because the product has been presented as a less harmful alternative than the conventional cigarette and, in some cases, harmless (19-20). In accordance with the above, a study conducted in Canada with 1188 subjects between 16 and 30 years revealed that 16.1 % had tried the e-cigarette (21). In contrast, in countries such as the United States, in recent years, the consumption of e-cigarettes has increased from 2 % in 2011 to 11 % in 2015, even more frequently than conventional cigarettes in adolescents (22).

E-cigarette is the most common of the electronic nicotine release system devices; it produces aerosols and its use is called "vaping." The expelled vapor is not harmless to health because it

uses high amounts of propylene glycol or glycerol, heats a solution at 250 degrees Celsius in refillable cartridges, and contains varying concentrations of nicotine between 0 and 24 milligrams. Besides, the actual nicotine contents of the cartridges do not usually match with those presented in the containers (23).

The nicotine levels that these cigarettes release can be higher than therapeutic nicotine, so they can generate addiction and withdrawal symptoms by reducing their use, in addition to high levels of cotinine (nicotine metabolite) similar to cigarrette smoking (60.6 + or – 34.3 versus 61.3 + or – 36.6 mg/ml) (24). Additionally, these devices have various flavors to attract the general population: sweet flavors contain diacetyl (flavor authorized for intake, not for inhalation), a substance that when inhaled becomes a risk factor of getting bronchitis obliterans (25).

E-cigarette is offered as a less harmful product than the conventional cigarette, which helps delay the decision to smoke (26); however, the aerosol it produces comes with potentially harmful components, which contain toxic, carcinogenic compounds, and heavy metals such as chromium, lead, and nickel (the latter, higher than in conventional cigarettes) (27). Among the health effects linked to e-cigarettes, the following stand out: explosion and burns, mainly in hands and face; an 18 % increase in airway resistance and a significant decrease in the nitric oxide exhaled fraction, which is observed in diseases such as inflammation of the airways, infectious and lipoid pneumonia, irritation of the pharynx and mouth, dry cough, disorientation, and heart failure. Vaping has the potential to modify the genetic expression of cells of the bronchial epithelium, which represents a risk of malignant transformation (28-31).

Regarding the starting age of cigarette consumption, the data show that this is decreasing. In this research, an average of 13 years was found, which matches the average age reported for Colombia by the Ministry of Health and Social Protection, through the *Overview of school health in Colombia* report (8). These results are also similar to those reported by Cisneros et al. (32), which identify 14 as the starting age for Mexican teens.

Regarding gender, women presented a higher incidence than men, a different result from those presented in other studies as the habit has been traditionally associated with men (33-34). Changes in social dynamics can explain this result, because women have had the opportunity to adopt behaviors and practices that were previously exclusive to men.

Tobacco consumption is associated with various family and social factors, and this study highlights independent factors, such as having a partner with a smoking habit, possibility of buying individual cigarettes, and being surrounded by friends that smoke. The factors described here have been reported by studies such as that of Morello et al., which found that using tobacco is associated with having friends who regularly consume these products (OR 12.6 95 % CI 7.8–20, 5) (35). By contrast, a study conducted in Cuba showed that having family members who are consumers (72 %), teachers who smoke (44 %), and having a partner who smokes (38 %) are among the most usual motivations for consuming tobacco (36).

From the independent factors related to tobacco consumption in this research, it is important to emphasize the ability of buying individual cigarettes—an aspect that, combined with the usual place of consumption (public places), is quite surprising owing to the multiple efforts made by Colombian government entities to restrict the sale of these products to minors and discourage their consumption. A clear example of this are the regulations that widely forbid the sale of tobacco products to minors, the tobacco consumption ban in public places, the rise in prices of these products, and the regulation of the sale per unit (37).

Protective factors were identified such as being of a high socioeconomic level and the perception that tobacco-related advertising may have an influence on their decisions to use it.

Regarding the study limitations, it is important to mention that only adolescents enrolled in official schools were included in the research, which may limit the ability to extrapolate the data to their peers with different characteristics.

The findings of this research are extremely important, given that they report an increase in the smoking habit frequency in adolescents and the new contribution of e-cigarettes in normal consumption. Moreover, they reflect clear changes in the consumption pattern described recently, such as a higher consumption frequency in women, which require strengthening prevention strategies and regulations regarding the sale of devices such as e-cigarettes.

The data found not only invite educational and government institutions to strengthen strategies aimed at reducing tobacco consumption in adolescents but also invite parents to inform their

children about the effects of tobacco consumption, because this event is socially transmitted.

Conclusions

Tobacco consumption is a recurring problem in teenage school students. The overall prevalence found is higher than previously reported, and the most frequently used product is the e-cigarette. It was observed that women had a higher consumption prevalence, a fact that shows that consumption patterns of these products have changed along with role women play in society.

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Conflicts of interest: None declared.

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