TABACO, DEPENDENCIA DE LA NICOTINA Y MOTIVACIÓN PARA DEJAR DE FUMAR EN ADOLESCENTES CON Y SIN TDAH

SMOKING, NICOTINE DEPENDENCE, AND MOTIVATION TO STOP IN ADOLESCENTS WITH AND WITHOUT ADHD

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INFORMACIÓN DEL ARTÍCULO

Resumen

Los adolescentes con Trastorno por Déficit de Atención e Hiperactividad (TDAH) fuman más que la población general. El efecto sobre consumo de tabaco de los estimulantes que se usan como tratamiento para el TDAH, es controvertido. Los tres objetivos del estudio fueron: comparar la prevalencia de fumadores en sujetos en tratamiento para el TDAH con un grupo control; comparar los niveles de dependencia de la nicotina entre los dos grupos y contrastar también su motivación para dejar de fumar. Los participantes eran adolescentes entre 12 y 18 años, con TDAH (n=94) y controles (n=93). Se recabó información sobre su consumo de tabaco, la dependencia a la nicotina entre los dos grupos y contrastar también su motivación para dejar de fumar. El diagnóstico de TDAH se asoció a ser fumador, aunque dicha diferencia mostraba solo una tendencia a la significación (OR=2.73; p=0.057). Los niveles de dependencia de la nicotina y la motivación para dejar de fumar, eran similares en ambos grupos. Los resultados señalan la importancia de realizar intervenciones preventivas y motivacionales en adolescentes con TDAH. El tratamiento para el TDAH podría prevenir el consumo de tabaco.

ABSTRACT

Smoking prevalence is higher in those adolescents with attention-deficit hyperactivity disorder (ADHD) compared to controls. The nature of the relation between smoking and stimulants is controversial. The three aims of the study were: to compare the prevalence of smokers in ADHD treated individuals versus controls; compare nicotine dependence levels; and contrast their motivation to stop smoking. Subjects were 12 to 18-year-old adolescents with ADHD (n=94) and controls (n=93). Information on cigarette smoking, nicotine dependence and motivation was obtained. ADHD showed a trend toward significance being individuals with ADHD more likely to smoke (OR=2.73; p=0.057). Nicotine dependence levels and motivation were comparable between groups. Results highlight the importance of preventive and motivational interventions among adolescents with ADHD. Treatment for ADHD may help to prevent smoking this population.
INTRODUCTION

Smoking is one of the main threats for health and it is associated with a high morbi-mortality. This is especially serious when there is a dual disorder, meaning co-morbidity of an addiction and a mental disorder. Smoking prevalence among population with mental disorders is higher compared to general population, they are more dependent on nicotine and they start smoking at a younger age. Considering that a significant part of mental disorders and drug use start during teenage years, children and adolescents who attend a mental health service should be considered a special risk group. This is particularly significant in one of the most common disorders among teenagers such as Attention Deficit Hyperactivity Disorder (ADHD). This disorder can include inattention, impulsivity and hyperactivity and could affect between 3 and 10% of school-age children in the US. In Spain, the prevalence of ADHD is estimated at 6.8%, consistent with other countries.

Research conducted in United States suggested that between 19-46% of adolescents suffering ADHD smoke daily, against 10-24% of teenagers smokers not suffering from this disorder. ADHD has been associated with smoking before the age of 15, with an increased risk of smoking at an adult age and with a lower quit rate, compared to those individuals who do not suffer from this disorder. Furthermore, evidence suggests that, among this population, smoking increases the chance of using alcohol and illegal drugs and future psychopathology. Studies comparing smoking among teenagers with and without ADHD, found a higher prevalence in those adolescents who had been diagnosed with ADHD as well as a higher nicotine dependence.

First-line recommended treatment for ADHD includes stimulants and behavior therapy. Stimulant medication (ie, methylphenidate, d-amphetamine) may lead to heightened reinforcing effects of nicotine and therefore, increase cigarette smoking. However, stimulants can also reduce the risk for smoking in ADHD adolescents and even reduce cigarette smoking below population rate. Therefore, the nature of the relation between smoking and stimulants is controversial.

On the other hand, concerning motivation to quit smoking, three out of four young smokers have thought of quitting smoking, two out of three claim to have made an attempt to quit in the last year at least once and 20% up to three attempts. However, there is no evidence regarding motivation to quit among teenagers diagnosed with ADHD.

This paper compared the proportion of smokers, ex-smokers and non-smokers in a sample of ADHD teenagers in pharmacological treatment with a control group. Secondly, nicotine dependence and motivation to quit were also compared.

We expected to find no differences between treated ADHD adolescents and controls regarding: 1) Prevalence of smokers; 2) Level of nicotine dependence; and 3) motivation to quit smoking.

The detection of smokers among ADHD adolescents, the evaluation of their nicotine dependence and motivation to quit smoking, allow a deeper knowledge of their reality and enable to develop preventive or therapeutic interventions to decrease the impact of smoking in this population.

METHODS

Sample

This was a case-control study. Inclusion criteria were: age between 12 and 18 years old, to have enough language proficiency, and to have informed parents or legal representative when underage. For the group with ADHD it was additionally required to have been diagnosed by a specialized team, according to diagnostic criteria DSM-IV-TR and being treated with pharmacotherapy, which means subjects had taken at least one dose when included in the present study. Both groups were expected to be comparable in sex, age and level of studies.

Patients of the control group attended the primary care centre Sant Rafael in Barcelona and were treated for any medical pathology, whereas ADHD patients were treated at the Psychiatry Department of the Vall d’Hebron University Hospital in Barcelona.

It was estimated that 190 subjects were necessary accepting an alpha risk of .05 and a beta risk less than .20 in a bilateral contrast (95 subjects were needed in each group to detect a difference equal or higher than 20% between them). A proportion of .33 in one of the groups was assumed. A rate of loss at follow-up of 0 was estimated. ARCSIN approximation was used.

Measures

Participants were informed about the study and engaged to participate in a regular visit by a health professional, who could be either their own general practitioner in case of the control group, or a psychiatrist in the ADHD group. No compensation was offered to participate and information was collected by the same health professional who engaged the participants.

Participants were required to sign a consent form. In case of under-age (under 18), parents or guardians signed also the consent form. Information on sociodemographic data, level of education, smoking in the last 30 days, 7 days and daily, and smoking in the household was collected. Nicotine dependence was assessed with the Fagerström Test for Nicotine Dependence (FTND) adapted to the
Spanish population. This six-item questionnaire assesses clinical dependence, and predicts smoking abstinence. The measure has been correlated with biochemical measures of dependence. Richmond test was used to assess motivation to quit smoking. This test includes four questions, the last two referring to the motivation to make a quit attempt in the following two weeks and six months. Interview lasted approximately 15 minutes.

The main variable of this research was to be smoker defined by having smoked at least one cigarette in the last 30 days. The secondary variables were level of nicotine dependence, number of cigarettes per day, and finally, motivation to stop smoking. All secondary variables were evaluated in daily smokers.

**Statistical analysis**

To compare homogeneity between groups χ² test was used for categorical variables, Student’s t test to compare means, and for those variables revealing differences between groups, Odds Ratio (OR) were calculated. To compare smoking between groups χ² test was used. Non-parametric test (U de Mann-Whitney) was used in the analysis of the variable number of cigarettes per day, due to the presence of outliers. Scores in the FTND and Richmond test were compared with Student’s t test. Finally, a logistic regression was performed, initially adding adjusting variables and then group variables. Data have been analyzed using SPSS 20.0 for Windows.

This project was approved by the Ethics Committee of Vall d’Hebron University Hospital and was funded by a research grant from the Catalan Pneumology Foundation (FUCAP).

**RESULTS**

Data from 187 patients were analyzed, 117 (62.6%) of them were male. The average age of the sample was 15.1 years old (SD=1.9; range 12-18). Place of birth of 156 (83.4%) individuals was Catalonia (Spain). A total of 35 (18.7%) patients claimed to have smoked in the last 30 days, 30 (16%) individuals referred to have smoked in the last week and 27 (14.4%) smoked daily. Two subjects defined themselves as ex-smokers. The average consumption was 8.5 cigarettes (SD=5.4; range 1-25). The average score in FTND was 2.5 (SD=2.3; range 0-7) and in the Richmond test was 4.1 (SD= 2.5; range 0-9).

Of the 187 patients, 94 belonged to the ADHD group and 93 to the control group. No differences were found in age, and level of studies between the groups. Regarding sex and place of birth, in the ADHD group there were more male (74.5% vs. 50.5%; χ²=10.4, df=1, p=.001; OR=2.86 [95% CI 1.54-5.26]) and more likely to be born in Spain than in the control group (90.4% vs. 76.3%; χ²=12.1, df=1, p=.001; OR=6.67 [95% CI 2.17-20]), which included more subjects mainly from South-America. Furthermore, patients with ADHD were more likely to live with smokers (57.4% vs. 39.8%; χ²=1.0; df=1, p=.303; OR=2.04 [95% CI 1.14-3.66]; table 1).

<table>
<thead>
<tr>
<th></th>
<th>ADHD (n=94)</th>
<th>Control (n=93)</th>
<th>p</th>
<th>OR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (mean, SD)</td>
<td>15.2 (1.9)</td>
<td>14.9 (2)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Level of education</td>
<td>65 (69.1)</td>
<td>73 (77.7)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Place of birth, Spain</td>
<td>85 (90.4)</td>
<td>71 (76.3)</td>
<td>&lt;.001</td>
<td>.15 (0.05-0.46)</td>
</tr>
<tr>
<td>Smokers in the household</td>
<td>56 (57.4)</td>
<td>37 (39.8)</td>
<td>.02</td>
<td>2.04 (1.14-3.66)</td>
</tr>
<tr>
<td>Smoking (in last 30 days)</td>
<td>24 (25.5)</td>
<td>11 (11.8)</td>
<td>.027</td>
<td>2.56 (1.17-5.59)</td>
</tr>
<tr>
<td>Smoking (in last 7 days)</td>
<td>19 (20.2)</td>
<td>11 (11.8)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Daily smokers</td>
<td>17 (18.1)</td>
<td>10 (10.8)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>In daily smokers (n=27):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of cigarettes/day (mean, IR²)</td>
<td>5 (7)</td>
<td>10 (4)</td>
<td>NS³</td>
<td></td>
</tr>
<tr>
<td>FTND⁴ score (mean, SD; range 0-10)</td>
<td>1.9 (2.1)</td>
<td>3.4 (2.4)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Richmond score (mean, SD; range 0-10)</td>
<td>3.7 (2.8)</td>
<td>4.6 (2.1)</td>
<td>NS</td>
<td></td>
</tr>
</tbody>
</table>

¹ Values are expressed in n (%), except said otherwise
² Interquartile range
³ Mann-Whitney U test applied.
⁴ Fagerström Test for Nicotine Dependence.
In the ADHD group, patients were taking pharmacotherapy that could be methylphenidate (83.6%), atomoxetine (11%), methylphenidate and atomoxetine (4.1%), and dextroamphetamine (1.4%). As seen in Table 1, the group with ADHD had higher rates of smokers compared to the control group (25.5% vs. 11.8%; χ²=4.9, df=1, p=.027; OR=2.56 [95% CI 1.17-5.59]). However, no statistical differences were found in smoking in the last 7 days or daily use between groups.

Considering daily smokers, no differences were observed between groups in the number of cigarettes smoked per day, level of nicotine dependence or motivation to quit smoking. Regarding motivation to quit smoking both groups were moderately motivated to stop smoking (table 1).

Smoking increased with age (t=8.9; df=72; p<.01). However, sex, household smokers or to be born in Spain were not associated with smoking.

Multivariate analysis showed that age increased the odds of smoking among adolescents (OR=1.77 [95% IC 1.17-1.7]; p=.007) and ADHD almost reached significance (OR=2.73 [95% IC 0.97-7.67]; p=.057), after adjusting for sex, level of education, living with smokers, and place of birth (table 2).

**DISCUSSION**

ADHD was associated with smoking; however differences with controls did not reach significance. First hypothesis of the study could not be confirmed. Data suggest ADHD as a risk factor for cigarette smoking as other studies have shown15,16,33–35, and that was consistent within the three parameters used for smoking (in the previous 30 days, in the previous 7 days or daily). However, differences were not statistically significant. This could have at least two possible explanations: drug treatment for ADHD may have attenuated differences by reducing tobacco use, which is consistent with studies with clinical population24-26 and a recent meta-analysis36, but it could also be explained because of a small sample size.

Regarding the second hypothesis, ADHD adolescents were found to have similar levels of nicotine dependence, as expected by the authors. Nevertheless, a closer look to data reveals that both number of cigarettes and dependence were higher in controls than in ADHD group, although differences were not significant. It is important to bear in mind that all adolescents with ADHD were being treated with medication; however we cannot assure medication had an effect reducing nicotine intake and dependence.

In relation to motivation to quit smoking, adolescents with ADHD showed a similar level of motivation to stop smoking than subjects in the control group. Similar results were found by Grana37 who found that motivation to quit in youngsters did not depend on their mental health. Globally, level of motivation to quit smoking was moderate. This could be potentially explained by the low perception at young ages of the risk of health problems and tobacco addictive capacity. This reinforces the need to deliver motivational interventions to quit smoking in young population.

This research has some strengths. Two samples of same age, living in the same area, and with main difference lying in having ADHD (according to DSM-IV-TR) are compared. The group with ADHD has a higher percentage of males but it could be explained by a higher prevalence of ADHD among males than females. Appointments were consecutives.

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Table 2. Two-step logistic regression results to predict smoking adjusted for sex, level of education, place of birth, household smokers and age (n=187).

<table>
<thead>
<tr>
<th></th>
<th>B¹</th>
<th>Wald</th>
<th>p</th>
<th>OR</th>
<th>OR-CI 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>-.171</td>
<td>.113</td>
<td>.737</td>
<td>.842</td>
<td>.310-.2.929</td>
</tr>
<tr>
<td>Level of education</td>
<td>1.003</td>
<td>2.086</td>
<td>.149</td>
<td>2.726</td>
<td>.699-.634</td>
</tr>
<tr>
<td>Place birth</td>
<td>.809</td>
<td>.978</td>
<td>.323</td>
<td>2.245</td>
<td>.452-.1.157</td>
</tr>
<tr>
<td>Household smokers</td>
<td>.317</td>
<td>.443</td>
<td>.506</td>
<td>1.374</td>
<td>.539-.3.498</td>
</tr>
<tr>
<td>Age</td>
<td>.571</td>
<td>7.160</td>
<td>.007</td>
<td>1.771</td>
<td>1.165-.6.91</td>
</tr>
<tr>
<td>group</td>
<td>1.004</td>
<td>3.634</td>
<td>.057</td>
<td>2.730</td>
<td>.972-.7.667</td>
</tr>
<tr>
<td>constant</td>
<td>-13.345</td>
<td>16.885</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td></td>
</tr>
</tbody>
</table>

¹ Groups were codified like ADHD=1 and Control=0.
and non-pre-selected in order to guarantee the maximum representativeness. Interestingly, there are no studies on motivation to quit smoking in this population. On the other hand, prevalence of daily smokers observed in the control group (10.8%) is coherent with data from the survey FRESC (10.5% of females and 9.8% of males of 15 to 16 years old)\textsuperscript{38}.

The main limitation is the small sample size. Main results may have reached significance if sample would have been larger. Data regarding daily smokers (that is nicotine dependence level and motivation to stop smoking), should be seen with caution due to the small sample size. Data were self-reported by subjects without biochemical validation, however evaluation of smoking via questionnaire is common and reliable\textsuperscript{39}. The design used in this study, precludes causal inferences. Treatment duration was not taken into account. Finally, no information about different subtypes of ADHD of the subjects was included, so no conclusions were reached in this respect.

Summarising, treated ADHD subjects showed higher and consistent smoking rates than controls counterparts, although differences were not significant. Nicotine dependence and motivation were comparable between groups. The role of medication is unclear but it might have helped to reduce nicotine intake and dependence. Adolescents who have started smoking regularly at that age should receive motivational interventions to increase their interest in reducing or quitting smoking. Further research should be undertaken to assess the efficacy of preventive and therapeutic interventions to reduce smoking in ADHD adolescents.

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Conflict of Interest Declaration

None.

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