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Mental health problems and smoking among adolescents from Southern Brazil

ABSTRACT

OBJECTIVE: To analyze the association between mental health problems and smoking in adolescents.

METHODS: A total of 4,325 adolescents aged 15 from the 1993 birth cohort of the city of Pelotas, Southern Brazil, was studied. Smoking was defined as having smoked one or more cigarettes in the previous 30 days. Mental health was assessed according to the total score of the Strengths and Difficulties Questionnaire. Score $\geq$ 20 points was considered positive. Data were analyzed using Poisson regression with adjustment for robust variance.

RESULTS: Smoking prevalence was 6.0% and about 30% of the adolescents presented some mental health problem. In the crude analysis, the prevalence ratio for smoking was 3.3 (95%CI 2.5; 4.2). After the adjusted analysis (for sex, age, skin color, family income, mother's level of schooling, group of friends who smoke, employment in the previous year, school failure, physical activity during leisure time and experimental use of alcohol), it decreased to 1.7 (95%CI 1.2; 2.3) among those with mental health problem.

CONCLUSIONS: Mental health problems in adolescence may be related to tobacco consumption.

DESCRIPTORS: Adolescent Behavior. Smoking. Mental Health. Socioeconomic Factors.

INTRODUCTION

Smoking is considered a public health problem and is related to 50 different incapacitating diseases. It is responsible for an average of 200 thousand deaths per year in Brazil and surpasses the sum of deaths caused by alcoholism, aids, traffic accidents, homicides and suicides.[a]

Smoking onset occurs, on average, when the person is between 12 and 13 years of age, at the beginning of adolescence, a period of numerous physiological, behavioral and psychosocial transformations.[a] These transformations can make adolescents become more susceptible to the adoption of behaviors which weaken their health, such as sedentariness, smoking, and alcohol and drugs consumption.

The *Pesquisa Nacional de Saúde do Escolar* (PeNSE – National Survey of Students' Health),[b] carried out in 2009 with students of the 9th grade of elementary school (13 and 14 years of age), in Brazil's 26 state capitals and in the

Federal District, showed that 24.2% of the students had smoked at least once in their life, and the current use of cigarettes (measured by consumption in the previous 30 days, independently of frequency and intensity), was 6.3%. The smoking prevalence in this study is in accordance with the findings of research with adolescents from the city of Pelotas, Southern Brazil, considering the different ages that were evaluated. Members of the 1993 birth cohort, visited at 11 years of age, reported a 3.7% prevalence of experimental use of tobacco.[19]

Cohort studies show that psychopathology precedes the development of smoking in adolescents.[3,5,21] Conduct disorders,[3] attention deficit/hyperactivity disorders[10] and delinquent behavior are the problems that are most frequently associated with smoking.[7]

However, the association between mental problems and use of tobacco remains inconclusive in the literature, due to the fact that few studies have been carried out about this subject, the majority of which are school-based, with different age groups and with distinct criteria for the definition of mental problems. In view of the scarce literature on the theme, the present study aimed to analyze the association between mental problems and tobacco use in adolescents.

METHODS

Cross-sectional analysis nested in the 1993 birth cohort study of Pelotas, state of Rio Grande do Sul. The municipality of Pelotas, in the South of Brazil, presents an estimated population of 345,181 inhabitants.[b]

The 1993 cohort recruited the live births of the urban area of the city (N = 5,249). Participants and relatives were followed up in different moments. Further details can be consulted in a published paper.[23] The information used in the present study was collected in the 2008 follow-up (N = 4,325), when the participants were 15 years old.

The variables were selected from standardized questionnaires with closed questions administered to the mothers and adolescents. To the adolescents, in addition to the individual questionnaire, a confidential one was also administered. A reduced questionnaire was re-administered to 10% of the interviewees in a new home visit and to 20% by telephone, in order to evaluate the reproducibility of the questionnaire, families' satisfaction and to identify possible failures of the interviewer.

The outcome was defined as having smoked one or more cigarettes in the previous 30 days.[17] The Strengths and Difficulties Questionnaire (SQD),[12] which measures the adolescent's emotional and behavioral characteristics, was administered to the mothers to identify the adolescents' mental health problems. The screening instrument validated for use in Brazilian children and adolescents[9] has 25 questions and encompasses five subscales (prosocial behavior, hyperactivity/inattention, emotional symptoms, conduct problems and peer relationship problems). The options of answers are: not true, somewhat true, certainly true, and each item receives a specific score. The sum of each subscale and the total sum enable the classification of the individual in three categories: normal behavior (0-15 points), borderline behavior (16-19 points) and abnormal behavior (20-40 points). In almost all the subscales (except for prosocial behavior), the higher the score, the higher the number of symptoms.[12] To build the total score of SDQ, four subscales are added: hyperactivity/inattention, emotional symptoms, conduct problems and peer relationship problems.

The variables used to control for confusion included demographic, socioeconomic and behavioral factors. The variables were operationalized as follows: sex (female; male), skin color (white; non-white); adolescent's age (continuous); mother's level of schooling (years of study: 0 to 4; 5 to 8; 9 to 11; 12 or more); family income (minimum salaries, in quintiles). The answers of other variables were dichotomized in yes/no (group of friends who smoke, experimental use of alcohol, group of friends who drink alcohol, episodes of failure at school, employment in the previous year and practice of physical activity during leisure time in the previous week).

A descriptive analysis of the sample and subsequent bivariate analysis with Pearson's chi-square test were carried out. A crude Poisson regression model with robust adjustment of variance was proposed. A significance level of 95% was defined for the associations. The variables with p < 0.20 in the bivariate analysis were considered possible confounders and were included in the multivariable analysis. The study's sample had an 80% power to detect a minimum prevalence ratio (PR) of 1.2.

The data were analyzed in the statistical program *Stata 11.0 (StatCorp, College Station, TX, USA)*.

An informed consent document was signed by the mothers and/or guardians of the adolescents. The project was approved by the Ethics and Research Committee of the School of Medicine of Universidade Federal de Pelotas (official letter no. 158/07).

RESULTS

We located 4,349 adolescents aged 15 and 4,325 were evaluated, corresponding to 85.7% of the study's original sample (N = 5,249).

A little more than half (51%) were girls, 64% had white skin color and approximately one fourth of the mothers

had level of schooling below four years of study. Among the adolescents, 46% and 61% had friends who smoked and drank alcoholic beverages, respectively. Failure at school was informed by 62% of the subjects and 78% answered they had not worked in the previous year (Table 1). Other data not presented in tables report mean age of 14.7 years (standard deviation – sd: 0.31 years) and family income median of R$ 1,000.00 (P25: R$ 591.00 - P75: R$ 1,660.00).

Smoking prevalence was 6.0%. Almost one third of the adolescents presented some kind of problem related to mental health (abnormal behavior), according to the total score of the SDQ. Among the SDQ subscales, the

highest prevalences of mental health problems were found in the emotional (38.0%), conduct (26.7%) and peer relationship (25.8%) domains (Table 2).

Smoking prevalence within the category of abnormal behavior was 10.9% compared to 3.3% in the reference category (p < 0.001) (Figure).

In the crude analysis, smoking was 2.5 (95%CI 1.8;3.5) and 3.3 (95% CI 2.5;4.2) times more prevalent in adolescents who presented borderline and abnormal SDQ scores, respectively, when compared to the adolescents with normal SDQ scores (p < 0.001). After adjusting for possible confounding variables, a significant association was maintained between smoking and the general SDQ score (p < 0.001). The prevalence ratio was reduced to 1.8 (95% CI 1.2;2.6) and 1.7 (95%CI 1.2;2.3) in adolescents categorized as presenting borderline and abnormal behavior, respectively (Table 3).

Table 1. Demographic, socioeconomic and behavioral characteristics of adolescents aged 15 from the 1993 Birth Cohort. Pelotas, Southern Brazil, 2008. (N = 4,325)

Variables	n	%
Sex		
Male	2,111	48.8
Female	2,214	51.2
Income (quintiles)		
1 (low)	926	21.5
2	791	18.5
3	886	20.7
4	825	19.3
5 (high)	855	20.0
Skin color		
White	2,769	64.0
Non white	1,554	36.0
Mother's level of schooling (years)		
0 to 4	924	23.0
5 to 8	1,658	41.3
9 to 11	946	23.6
12 or more	488	12.1
Group of friends who smoke		
No	2,162	53.6
Yes	1,868	46.4
Group of friends who drink alcoholic beverages		
No	1,603	39.2
Yes	2,482	60.8
Failure at school		
No	1,568	37.2
Yes	2,653	62.8
Employment in the previous year		
No	3,363	77.8
Yes	962	22.2
Physical activity during leisure time in the previous week		
No	1,055	24.4
Yes	3,270	75.6

Table 2. Smoking prevalence, total score and domains of the *Strengths and Difficulties Questionnaire* in adolescents aged 15 from the 1993 Birth Cohort. Pelotas, Southern Brazil, 2008. (N = 4,325)

Variables	n	%
Smoking		
No	3,969	94.0
Yes	253	6.0
Total Score		
Normal	2,591	60.1
Borderline	564	13.1
Abnormal	1,158	26.8
Emotional Symptoms		
Normal	2,011	46.6
Borderline	663	15.4
Abnormal	1,640	38.0
Conduct Problems		
Normal	2,703	62.6
Borderline	461	10.7
Abnormal	1,152	26.7
Hyperactivity/ Inattention		
Normal	2,949	68.3
Borderline	471	10.9
Abnormal	895	20.7
Peer Relationship Problems		
Normal	2,883	66.8
Borderline	319	7.4
Abnormal	1,111	25.8
Prosocial Behavior		
Normal	3,972	92.1
Borderline	123	2.8
Abnormal	219	5.1

Table 3. Crude and adjusted prevalence ratios for smoking according to the total score of the *Strengths and Difficulties Questionnaire,* in adolescents aged 15 belonging to the 1993 Birth Cohort. Pelotas, Southern Brazil, 2008. (N = 4,325)

SDQ Classification	Crude analysis RP (IC95%)	Adjusted analysis[a] RP (IC95%)
General Score	p < 0,001*	p < 0,001*
Normal	1	1
Borderline	2,5 (1,8;3,5)	1,8 (1,2;2,6)
Abnormal	3,3 (2,5;4,2)	1,7 (1,2;2,3)

[a] Adjusted for sex, age, skin color, family income, mother's level of schooling, group of friends who smoke, employment in the previous year, failure at school, physical activity in leisure time and experimental use of alcohol.

* Wald Test

Figure. Smoking prevalence and 95% confidence interval according to the total score of the *Strengths and Difficulties Questionnaire* in adolescents aged 15 belonging to the 1993 Birth Cohort. Pelotas, Southern Brazil, 2008. (N = 4,325)

DISCUSSION

In the present study, an association was found between mental health problems and smoking, and the individuals classified as having abnormal behavior by the SDQ presented higher smoking prevalence when compared to the individuals classified as normal. We chose the total SDQ score because it is a global psychopathology measure which focuses on adolescents who present at least one mental health problem, without specifying the type.

Some methodological limitations may have affected the findings. It is known that administering the SDQ to many informants can increase the instrument's specificity.[13] In the present study, the SDQ was administered only to the adolescents' mothers, which might underestimate the prevalence of emotional problems, like depression and anxiety, and overestimate conduct and inattention/hyperactivity problems. Another limitation is the absence of information on parents' smoking habits in this follow-up of the cohort, which might be considered a confounding factor, according to the literature.[17] However, in a separate analysis adjusting for maternal smoking habits, the association between mental problems and smoking remained significant (the data were not presented).

In addition, reverse causality may have occurred, considering that the outcome (smoking) and the main exposure (mental health problems) were collected at the same moment, which hindered the establishment of the direction of the association. Nevertheless, in two sub-analyzes (one of them adjusting the variable mental health at the age of 11, and the other evaluating the effect of presenting a mental health problem at the age of 11), the results corroborate the hypothesis of this study (the data were not presented), i.e., adolescents who presented mental health problems at the beginning of adolescence had higher probability of being smokers at the age of 15.
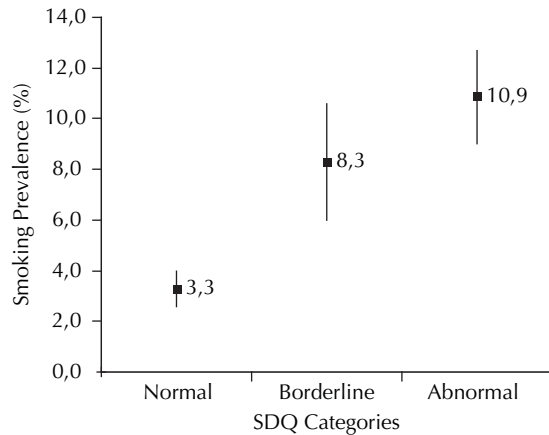
The smoking prevalence detected in this study (6.0%) was similar to the one found in the PeNSE study,[b] but it is lower than the one reported in another study with adolescents from Pelotas (16.6%).[16] Research conducted with adolescents aged between 13 and 15 years in Florianópolis, Porto Alegre and Curitiba (Southern Brazil) found smoking prevalences of 10.7%, 17.7% and 12.6%, respectively.[15] The lower prevalence found in the present study can be the result of the lower age of the studied individuals, but also of a possible underreport of cigarette consumption. Smoking prevalence may be underestimated in the present study because, despite the confidentiality of the questionnaire, adolescents not always tell the truth concerning the use of cigarettes. In a study with students from Pelotas aged 13 and 14 years, smoking prevalence was evaluated by means of a questionnaire and by the measure of cotinine in the urine, and an important underreport compared to the gold standard was detected.[18]

The SDQ has been used in studies to screen mental health problems in Brazilian children and adolescents.[4] It is an instrument validated in Brazil,[8] is easily administered, has a short version and low-cost. However, as it is a screening instrument and not a diagnostic instrument, the presence of mental health problems does not imply the existence of some disease to be treated.[14] Studies evaluating the association between smoking and mental health problems, identified by the SDQ, were not found.

The prevalence of individuals classified as having abnormal behavior was 26.8% and as having borderline behavior, 13.1%, according to the total SDQ score. Such prevalences can be considered high, but they were similar to the ones found in epidemiological studies that used the SDQ, parents version, in Brazilian children and adolescents[9] and lower than the one found in the birth cohort of São Luís (Northeastern Brazil).[20]

Studies conducted in the United States and in the United Kingdom have shown an association between smoking and specific psychiatric disorders like anxiety, depression, conduct and hyperactivity/inattention problems.[1,2,5] These studies used several instruments or questionnaires based on clinical criteria to make the diagnosis of these psychiatric problems in adolescents.

Although there are studies that confirm the association between mental health problems and smoking, there is no consensus about the direction of this association. Some studies have shown that mental health problems determine smoking;[1,6] another study has shown the inverse relationship.[11] Cohort studies have shown that psychopathology is an important predictor of smoking in adolescents.[3,5,21]

The exact mechanism of the co-morbidity between smoking and psychiatric disorders is not known, but it might be explained by the combination of one or more of the following factors: opportunity, self-medication, vulnerability (familial/genetic or environmental) and neurobiological alterations that are common to psychiatric disorders and smoking.[22] Nicotine can act to alleviate the symptoms, like attention enhancement, in individuals with inattention and hyperactivity.[1]

Our study showed that psychopathology can be considered a marker for tobacco use in adolescents. Smoking prevention can benefit from the identification and treatment of adolescents who present possible mental health problems. Prospective studies are important to elucidate the emergence of mental health problems in earlier ages. This may confirm the direction of the association between such problems and cigarette use and contribute to plan interventions against smoking.

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