RESEARCH ARTICLE

Social and socio-economic factors associated with adolescent Cannabis smoking – Results from the Danish ESPAD survey

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Munk L, Molsted S, Pedersen M. Social and socio-economic factors associated with adolescent Cannabis smoking – Results from the Danish ESPAD survey. Addict Clin Res 2017;1(1):1-4.

BACKGROUND: *Cannabis* is a widely used psychoactive substance among schoolchildren. It reduces the brain's learning capacity, is associated with early school leaving and lower educational level in adulthood. The objective was to assess determinants of *Cannabis* smoking among adolescents in Denmark. Associations between patent education, subjective socioeconomic position, peers smoking *Cannabis,* family pattern and *Cannabis* smoking were estimated.

METHOD: The study was based on multiple logistic regression analyses of data from The European School Survey Project on Alcohol and Other Drugs.

RESULTS: Broken family pattern and peer *Cannabis* smoking were associated with adolescent *Cannabis* smoking. Neither parental educational level nor the adolescent's subjective socioeconomic position was found to be associated with frequent *Cannabis* smoking.

CONCLUSION: Frequent *Cannabis* smoking among ninth graders is strongly associated with peers smoking *Cannabis* and living with non-cohabitating parents. Thus in systematic intervention programs, it may be purposeful to pay special attention to young people from non-intact families and intervene in the environments where adolescents socialize.

Key Words: *Adolescents; Cannabis; Parental education; Subjective socioeconomic position; Peers; Family pattern*

DESCRIPTION

Adolescent *Cannabis* smoking is a public health problem in Denmark and in many other European countries. After tobacco and alcohol, *Cannabis* is the most popular psychoactive substance among Danish schoolchildren (1). Even though it is forbidden to sell alcohol to young people below the age of 16 years, forbidden to sell cigarettes to persons younger than 18 years and illegal to smoke *Cannabis* in Denmark these substances are widely used by many Danish adolescents. In an average Danish ninth grade 31% of all students are daily cigarette smokers, 75% have been drunk at least once within lifetime and 6.8% have smoked *Cannabis* at least once within the last month (2). This intoxication culture among Danish adolescents is alarming as adolescents are particularly vulnerable to substance use.

Even though the human brain is structurally developed at birth, it is not fully matured until the early adulthood. The brain's final neural development takes place during adolescence when the capacity of learning is at its highest. This is also a period, where the brain is most vulnerable to repeated use of sedative substances including *Cannabis* (3).

Recent studies have suggested that *Cannabis* smoking debut in adolescence is a determinant of early school leaving and lower educational level in adulthood (4,5). Thus, early *Cannabis* debut may have crucial implications at an individual and a community level. The young *Cannabis* user may on the long-term experience deprived job opportunities, need for social welfare and reduced satisfaction with life in its whole (6).

Since 1995, substance use among Danish adolescents have been monitored every fourth year by the European School Survey Project on Alcohol And other Drugs (ESPAD) (2). According to the ESPAD 2011 survey the Danish adolescents stand out as those with the highest alcohol consumption compared to their peers in other European countries (7). Previous studies have reported strong associations between alcohol intake, cigarette smoking and *Cannabis* smoking among adolescents (8,9).

The task of developing preventive policy and strategies for early *Cannabis* debut is difficult, partly due to the fact that the drug is illegal in Denmark. Furthermore, more evidence of factors that may lead to *Cannabis* smoking in adolescence are warranted, among them the effect of socioeconomic- and social factors on *Cannabis* smoking among adolescents. *Cannabis* smoking may be associated with family factors including the parent's educational level, financial resources and family pattern. Furthermore, *Cannabis* smoking among adolescents may also be associated with peers habits and behaviors.

We hypothesized that adolescents with lower educated parents, low subjective socioeconomic position (SSP), *Cannabis* smoking peers and broken families were more likely to smoke *Cannabis*.

Therefore, the aim of this study was to investigate the associations between Danish adolescents' *Cannabis* smoking and parent educational level, SSP, family pattern and *Cannabis* smoking among peers.

METHODS

All analyses were based on the Danish data from ESPAD 2011. The ESPAD is a regularly repeated cross-sectional survey aimed to monitor alcohol, tobacco and drug use among students from the ninth grade from 36 European countries every fourth year. The present study was based on the Danish data on 2,768 students from the ESPAD 2011. Data were collected from self-reported questionnaires handed out to the students in randomly selected Danish public and private schools. Out of the 231 selected schools, 97 (42.0%) participated in the survey. Ten percent of the students were not in school on the day that the survey was conducted. The target population of ESPAD was students born in 1995, who were 15 years old at the time of the survey. As all students in the classes answered the questionnaire, persons born in 1993 (0.5%), 1994 (17.5%) and 1996 (2.2%) were also included. The majority of students were born in 1995 (79.8%).

All data in the present study were self-reported.

Measurements

The outcome of interest was frequent *Cannabis* smoking. The variable was dichotomized into students who had smoked *Cannabis* more or less than three times within the last month, year or their lifetime (defined as frequent smoking). The students' use of *Cannabis* was assessed by asking them "On how many occasions (if any) have you used marijuana or hashish (*Cannabis*) a) in your lifetime? b) During the last 12 months? c) During the last 30 days?" The answer categories were "0 times"; "1-2 times"; "3-5 times"; "6-9 times"; "10-19 times"; "20-39 times" and "40 times or more".

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Received: September 25, 2017, Accepted: October 20, 2017, Published: October 25, 2017

Five exposure variables were included:

1. Mothers and

2.Fathers education level was assessed using the question "What is the highest level of schooling your mother and father completed?". The answer categories were "Completed primary school or less"; "Some secondary school"; "Completed secondary school"; "Some college or university"; "Completed College or university"; "Don't know" and "Does not apply". The answers were divided into three categories: high school, college or higher education;

3.Family pattern was measured by asking: "Which of the following people live in the same household with you?" The possible answers were "I live alone"; "With my father"; "With my stepfather"; "With my mother"; "With my stepmother"; "With my brother (s)"; "With my sister (s)"; "With my grandparent (s)"; "With other relative (s)"; "With non-relative (s)". The answers were grouped and dichotomized into "With both parents" or "Other".

4.The students' SSP were measured by asking: "How well off is your family compared to other families in your country?" The possible answers were: "Very much better off"; "Much better off"; "Better off"; "About the same"; "Less well off"; "Much less well off" and "Very much less well off". The answers were categorized into "High", "Middle" and "Low".

5.*Cannabis* smoking peers were measured by asking: "How many of our friends would you estimate smoke marijuana or hashish (*Cannabis*)?" The students could choose between the answers "None"; "A few", "Some"; "Most" or "All". The answers were dichotomized into "A few" ("None" and "A few") and "Many" ("Some", "Most" or "All").

Additionally three other variables were included as potential confounders:

1.Amount of pocket money (dichotomized into <150 Dkr weekly or ≥150 Dkr weekly)

2.Parental knowledge of which the students spend their evenings with (dichotomized into high/low parent control), and

3.Cigarette smoking (dichotomized into yes/no). In all models, the potential confounders were included if they were associated with the exposure variable and were risk factors for the outcome variable (data not shown). Further details on the questionnaire can be viewed elsewhere (2).

Participation in the survey was voluntary and the responses were anonymous. Authorities of all schools approved the students' participation in the survey. All personal information was fully anonymized and the study was in accordance with the rules of the Danish ethical committee and The Data Protection Agency.

Statistical analysis

Multiple logistic regression analyses were used to estimate the associations between *Cannabis* smoking and the exposure variables. Data are presented as numbers, percentages and odds ratio (or) with 95% confidence interval (CI). Tests for interaction with gender were performed in all models; however, none of the interactions were significant thus no analyses were stratified according to gender. The descriptive data were however stratified by gender to illustrate potential gender differences.

Complete case analyses were used as missing strategy and all incomplete answers were excluded in the specific analyses. Confounder adjustment is described above in Methods. The level of significance was $P \leq 0.05$. The statistical analyses were conducted in SAS 9.4.

RESULTS

Table 1 shows the sample characteristics of the participants. Eighteen participants did not report their gender and thus data are based on 2,750 students (48% boys and 52% girls). The majority of students were born in 1995 (boys 75.0% and girls 84.5%) and 71.2% lived with two parents. Frequent *Cannabis* smoking was reported by 12.0% of the students (61.7% were boys and 38.3% were girls). Twenty percent of the students answered that some or all of their peers smoked *Cannabis* frequently. Cigarette smoking was reported by 47.4% of the students.

TABLE 1

The sample characteristics stratified according to gender. Total n=2,768, boys n=1,319, girls n=1,431, missing n=18

Variables	Total (n)	%	Boys (%)	Girls (%)	Missing (n)
Age					30
13-14 year	2,245	18.0	75.9	12.4	
15-16 year	493	82.0	24.1	87.6	
Frequent smoking *cannabis*					20
2 times or less	2,419	88.0	84.6	91.2	
3 times or more	329	12.0	15.4	8.1	
Mother's educational level					193
≤ High school	1,165	45.2	43.6	46.7	
College	592	23.0	22.4	23.7	
Higher education	325	12.6	12.3	12.9	
Unknown	493	19.2	21.7	16.7	
Father's education level					194
≤ High school	1,180	45.8	45.4	46.6	
College	317	12.3	10.9	13.7	
Higher Education	404	15.7	15.6	15.6	
Unknown	673	26.2	28.1	24.1	
Socioeconomic position					18
Low	598	21.7	24.9	18.9	
Middle	1,869	68.0	65.3	70.4	
High	283	10.3	9.8	10.7	
Living with cohabitating parents					18
Lives with both parents	1,958	71.2	73.2	69.4	
Other	792	28.8	26.8	30.6	
No. of friends who smoked *cannabis*					51
None/few	2,172	79.9	80.8	79.2	
Some/all	545	20.1	19.2	20.8	
Pocket money					182
0-150 Dkr/week	1,565	60.5	61.0	60.1	
>150 Dkr/week	1,021	39.5	39.0	39.9	
Parental control					47
High	1,668	61.3	52.4	69.4	
Low	1,053	38.7	47.6	30.6	
Cigarette smoking					40
Yes	1,294	47.4	45.9	48.8	
No	1,434	52.6	54.1	51.2	

Table 2 shows that there was no significant association between parental educational level and frequent adolescent *Cannabis* smoking.

TABLE 2

Association between parental level of education and frequent *cannabis* smoking

Maternal education level	OR (95% CI)*	OR (95% CI)**
(n=2,032)	P=0.47	P=0.49
≤ High school	1.00 (Ref.)	1.00 (Ref.)
College	0.85 (0.62-1.17)	1.04 (0.73-1.48)
Higher education	1.09 (0.75-1.58)	1.29 (0.86-1.94)
Paternal education level	OR (95% CI)*	OR (95% CI)**
(n=1,857)	P=0.26	P=0.19
≤ High school	1.00 (Ref.)	1.00 (Ref.)
College	0.72 (0.46-1.12)	0.90 (0.55-1.47)
Higher education	1.06 (0.75-1.51)	1.39 (0.95-2.06)

**Unadjusted, **Adjusted for gender, age, parental knowledge of with whom the students spend their evenings with and cigarette smoking.*

Table 3 shows that there was no significant association between frequent Cannabis smoking and SSP.

TABLE 3

Association between SSP (Subjective Social Position) and frequent *cannabis* smoking

SSP (n=2,548)	OR (95% CI)* P<0.01	OR (95% CI)** P=0.60
High	1.00 (Ref.)	1.00 (Ref.)
Middle	0.70 (0.53-0.91)	0.94 (0.68-1.29)
Low	1.08 (0.73-1.60)	1.15 (0.73-1.82)

**Unadjusted, **Adjusted for gender, age, parental knowledge of with whom the students spend their evenings with and cigarette smoking.*

Table 4 shows that students with many Cannabis smoking peers were significantly more likely to smoke Cannabis compared with students with few Cannabis smoking peers OR 6.09 (4.60-8.08).

TABLE 4

Association between number of *Cannabis* smoking friends and frequent *Cannabis* smoking

No. of peers smoking *Cannabis*	OR (95% CI)*	OR (95% CI)**
(n=2,550)	P<0.0001	P<0.0001
Few	1.00 (Ref.)	1.00 (Ref.)
Many	11.40 (8.83-14.72)	6.09 (4.60-8.08)

**Unadjusted, **Adjusted for pocket money, parental knowledge of with whom the students spend their evenings with and cigarette smoking.*

Table 5 shows that adolescents not living with both parents were more likely of being frequent Cannabis smokers than adolescents living with both parents OR 1.87 (1.43-2.45)

TABLE 5

Association between frequent *cannabis* smoking and family pattern

Living with cohabitating parents	OR (95% CI)*	OR (95% CI)**
(n=2,548)	P<0.0001	P<0.0001
Living with both parents	1.00 (Ref.)	1.00 (Ref.)
Other	2.21 (1.75-2.79)	1.87 (1.43-2.45)

**Unadjusted, **Adjusted for gender, age, pocket money, parental knowledge of with whom the students spend their evenings with and cigarette smoking.*

DISCUSSION

This study found that being a frequent *Cannabis* smoker was associated with having friends who smoked *Cannabis* and with living without both parents. Neither parental educational level nor the adolescent's SSP were found to be associated with frequent *Cannabis* smoking.

Developmental psychology theories have described how young people gradually separate themselves from their parents to become more independent individuals. Young people spend increasingly more time with friends and get their impulses from them (10,11). This phenomenon could help us to frame and understand the findings; i.e., that having *Cannabis* smoking friends was a more important determinant of *Cannabis* smoking than parental educational level. The association between frequent *Cannabis* smoking and having *Cannabis* smoking friends has been reported in other studies. In a Croatian study based on data provided by ESPAD 2003, Franelic et al. (12) found that Danish girls had a more than seven times increased risk of ever having smoked *Cannabis* when their friends did. The same result was found in an Icelandic study of 7,084 14-16 year adolescents (13). Thus, the young peoples' social environment may be a very important area in terms of having an increased risk of *Cannabis* smoking. Conversely they also found that time spend in company with their parents had a slightly protective effect on young peoples' experimentation with *Cannabis* (13). Adolescents' *Cannabis* smoking appears to be a social phenomenon as the most important determinant in this study was shown to be peers' *Cannabis* smoking. The same trend has been shown for binge drinking among adolescents (7). Thus, the possible association between *Cannabis* smoking and binge drinking should be estimated in future research.

Strength of this study was that the analyses were based on 2,768 responders from a well-designed study. As a result of a detailed and comprehensive questionnaire, adjustments of several potential confounders were included in the regression analyses. However, the study results should be interpreted with the following limitations in mind:

1.Due to the nature of the cross-sectional design it was not possible to provide causal associations,

2.The data may comprise some recall bias (e.g. the rating of *Cannabis* smoking among friends may be overestimated),

3.The study did not include schools for students with special needs, and

4.The data on parental educational level was of poor quality due to a large amount of missing data and students who did not possess information on their parents' educational level. The lack of a statistical significant association between parental educational level and frequent *Cannabis* smoking could be the result of low power in the present study.

The study results are viewed as generalizable for other adolescents in countries with a similar intoxication culture as the Danish. As students from special needs schools are not included in the study, results are only generalizable for adolescents without special needs. Finally it should be mentioned that 10% of the students were absent at the day data were collected. Whether or in which extent these students may have a higher consumption of *Cannabis* than the students attending school that day is unknown.

This study showed that frequent *Cannabis* smoking among adolescents from ninth grade was strongly associated with peers who smoked *Cannabis*. Thus, policy and interventions to prevent *Cannabis* smoking should be implemented in the environments where adolescents meet peers and find their inspiration. This could be in primary- and high schools, during leisure and recreational activities like sports clubs and on blocks, YouTube and other social media where young people socialize with peers. The study showed that adolescents not living with both parents had higher odds of being a frequent *Cannabis* smoker. Thus, when it comes to policy and prevention it may be purposeful to pay special attention to young people from non-intact families or young people who for various other reasons do not live together with cohabitating parents.

CONCLUSION

In conclusion, this study revealed factors that were associated with adolescent *Cannabis* smoking. Adolescents with many *Cannabis*-smoking peers were at greater risk of smoking *Cannabis* compared to adolescents with none or few *Cannabis*-smoking peers. Furthermore, adolescents who did not live with both parents had an increased risk of smoking *Cannabis*.

ACKNOWLEDGEMENT

We thank Professor Svend Sabroe for enabling us to answer our research questions by letting us conduct our analyses on ESPAD data.

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