

Smoking in prison: a hierarchical approach at the crossroad of personality and childhood events

Stavroula A. Papadodima, Emmanouil I. Sakelliadis, Theodoros N. Sergentanis, Orestis Giotakos, Ioannis N. Sergentanis, Chara A. Spiliopoulou

Background: Smoking has long been considered part of prison culture and studies have shown a high prevalence of smoking within correctional facilities. **Methods:** A self-administered, anonymous questionnaire was administered to 173 male prisoners in the Chalkida prison, Greece. To assess current smoking habits, a hierarchical approach was adopted. The underlying conceptual framework included: (i) demographic parameters, (ii) adverse childhood history (physical abuse, parental neglect, parental divorce, alcoholism in the family, sexual abuse and psychiatric condition in the family), (iii) education, personality traits, such as impulsivity (Barrat Impulsivity Scale-11), aggression (Buss-Perry Aggression Questionnaire and Lifetime History of Aggression), and personal history of mental disease, (iv) prison-related features (duration of sentence, sentence already served and change in smoking habits during imprisonment). **Results:** Eighty percentage of the study sample reported current smoking; 43.4% disclosed deterioration in their smoking habits during imprisonment. The hierarchical approach pointed to: (i) adverse childhood events, i.e. alcoholism in the family [adjusted odds ratio (OR)=6.29, 95% confidence interval (CI): 2.44–16.25], psychiatric condition in the family (adjusted OR=4.10, 95% CI: 1.31–12.84), physical abuse (adjusted OR=2.90, 95% CI: 1.30–6.46), parental neglect (adjusted OR=2.66, 95% CI: 1.19–5.95), parental divorce (adjusted OR=2.14, 95% CI: 1.00–4.56), and (ii) impulsivity (adjusted OR=2.26, 95% CI: 1.12–4.58) as independent risk factors. In addition, deterioration of smoking habits during imprisonment exerted an effect of borderline significance (adjusted OR=2.02, 95% CI: 0.97–4.24). **Conclusions:** Heavy smoking in prison principally integrates two components: unfavourable childhood and current personality traits (impulsivity).

Keywords: abuse, childhood experiences, impulsivity, parental alcoholism, prison, smoking

Introduction

Although public health tobacco control strategies in developed countries have succeeded in lowering tobacco use in the general population^{1,2}, this trend is not reflected upon certain marginalized populations, such as illicit drug users³. These groups are all overrepresented in prisoner populations⁴; indeed, smoking has long been considered part of prison culture and studies have shown a high prevalence of smoking within correctional facilities.^{5,6}

Smoking essentially incorporates a variety of risk factors. Immutable demographic features (such as gender,^{7,8} ethnicity⁸), adverse childhood events (such as physical abuse,^{9,10} sexual abuse,¹¹ parental separation,¹² parental alcohol abuse¹³), history of mental disease,⁷ psychiatric disorders,⁷ as well as personality traits, for instance aggression¹⁴ and impulsivity¹⁵, have been described as risk factors for smoking. A variety of prison-related parameters may also be of importance, as smoking in prison may be a fairly distinct entity.¹⁶

Given that all the above risk factors may well coexist and interact with each other, the approach to the phenomenon of smoking is methodologically challenging. Several factors may overlap or be part of the same causal pathway;¹⁷ as a result, a purely data-driven, stepwise approach may not describe adequately the phenomenon. In an attempt to overcome this problem, a conceptual framework has been created by our team and a hierarchical approach has been followed (see

Victoria *et al.*¹⁸ and Fonseca *et al.*¹⁹). In our population, smoking has been envisaged as the outcome of four sets of parameters: immutable demographic factors; adverse childhood events; education, personality traits and mental health; and prison-related parameters (table 1). Given their successive nature over time, each set of parameters may well exert its effects upon all the following.

This study aims to assess smoking in prison through a hierarchical approach; in Greece, tobacco smoking has never before been investigated in the correctional population. A variety of potential risk factors are hierarchically evaluated; to our knowledge, this is the first in-depth, simultaneous analysis of so many aspects in the context of prison.

Methods

Population and structure of the questionnaire

The Chalkida prison, where this survey was conducted, is a male remand and sentence prison located in Central Greece. Approval from the Ministry of Justice was obtained for the survey. A self-administered, anonymous questionnaire, taking between 20 and 30 min to complete, was administered to 173 prisoners, i.e. the total number of prisoners in the facility. Written informed consent was obtained before the administration of the questionnaire. The purpose of the study was thoroughly described and the voluntary nature of participation emphasized as part of the consent procedure.

The questionnaire included items on (i) current smoking habits and change in smoking habits during imprisonment, (ii) demographic parameters (sex, age and nationality), (iii) adverse childhood history (physical abuse, sexual abuse, parental neglect, parental divorce, alcoholism in the family),

Department of Forensic Medicine and Toxicology, National and Kapodistrian University of Athens, Athens, Greece

Correspondence: Stavroula A. Papadodima, M. Asias 75, Goudi, 115 27, Athens, Greece, tel: +30 21 07 462 431, fax: +30 21 07 706 868, e-mail: stpabd@gmail.com, stpabd@med.uoa.gr

(iv) history of mental disease, (v) aggression, impulsivity and educational attainment; low educational attainment was defined as being analphabetic or having finished solely the primary school (vs secondary-high school and university) and (vi) prison-related parameters (duration of sentence, sentence already served, recidivism).

Current smoking habits have been evaluated by the following question: 'Please choose the response that describes your current smoking habits'. The possible responses were: (i) 'I have never smoked', (ii) 'I have quit smoking', (iii) 'I am smoking <5 cigarettes/day', (iv) 'I am smoking 6–20 cigarettes/day', (v) 'I am smoking 21–50 cigarettes/day' and (vi) 'I am smoking >50 cigarettes/day'. Based on the answers of the subjects, an ordinal variable-score was created, i.e. 0 = 'I have never smoked'/'I have quit smoking', 1 = 'I am smoking <5 cigarettes/day', 2 = 'I am smoking 6–20 cigarettes/day', 3 = 'I am smoking 21–50 cigarettes/day' and 4 = 'I am smoking >50 cigarettes/day'.

The change in smoking habits during imprisonment has been evaluated by the following item: Within prison, I (i) began smoking (ii) have been smoking more frequently (iii) have not changed my smoking habits (iv) have been smoking less frequently (v) quit smoking. Based on the above replies, a binary variable has been created, to express deterioration in smoking habits during imprisonment, i.e. 0 = 'have been smoking less frequently'/'quit smoking'/'have not changed my smoking habits' and 1 = 'have been smoking more frequently' or 'began smoking'.

Hostility and aggression was assessed by using the Buss–Perry Aggression Questionnaire (BPAQ), a 29-item questionnaire containing brief statements to which a number ranging from 1 to 5 should be assigned.²⁰ Lifetime History of Aggression (LTHA) contains nine questions concerning animal abuse, robberies, drug sale, use of knife and other similar act in the past.²¹ Impulsivity was assessed by using the Barrat Impulsivity Scale—BIS-11, a 30-item scale with a four-point scale.²²

Calculation of response rates and statistical analysis

For the calculation of response rates, the American Association for Public Opinion Research Guidelines were adopted. Questionnaires with >80% items completed were considered complete and those with 50–80% items filled in were characterized as partial responses; both complete and partial responses were suitable for further analysis. On the contrary, questionnaires with <50% of items completed were considered break-offs and were consequently not included in the subsequent analysis. In addition, the two items concerning smoking (i.e. current smoking habits and change in smoking habits during imprisonment) were set as *crucial questions*; in case none of them was answered, the case was considered break off and was not included in the subsequent analysis, whereas answer to one of the two items was considered partial response and was included in the analysis.²³

Current smoking has been treated as the main outcome of the analysis. Since current smoking is an ordinal variable, ordinal logistic regression was performed to assess its associations with risk factors; the proportionality-of-odds assumption was evaluated by the appropriate likelihood-ratio test. To ensure comparability of odds ratios (ORs), all possible risk factors were converted to binary variables. Continuous variables were converted as follows; 0 = < median value, 1 ≥ median value).

The statistical approach followed the following two steps: (i) evaluation of association between possible risk factors and current smoking (unadjusted ORs through univariate ordinal

Table 1 The conceptual hierarchical framework of the study

Immutable demographic features (gender ^a , age, nationality)
Adverse childhood history (physical abuse, parental neglect, parental divorce, alcoholism in the family, sexual abuse, psychiatric condition in family)
Education, personality traits and mental health (aggression, impulsivity, educational attainment, history of mental disease)
Prison-related parameters (duration of sentence, sentence already served, recidivism, change in smoking habits)
SMOKING

a: not applicable in the context of a facility for male prisoners

logistic regression) and (ii) hierarchical approach. Each variable in the conceptual framework had to be adjusted for variables in the precedent level of the framework (table 1); for instance childhood events were adjusted for immutable demographic features, whereas personality traits were adjusted for childhood events as well as for demographic features. Statistical significance was also a criterion for retaining or eliminating a variable in the adjustment procedures.

Statistical analysis was performed with STATA 8.0 statistical software (Stata Corporation, College Station, TX, USA).

Results

Among 173 questionnaires, eleven break-offs occurred (nine cases answered to <50% of questions and two cases did not fill in either of the two crucial questions), resulting in a response rate equal to 162/173 (93.6%); as mentioned above, the analysis was based on the 162 questionnaires. Regarding the two crucial questions, 128/162 (79.0%) participants filled in both items, 17/162 (10.5%) filled in solely the question concerning current smoking habits and 17/162 (10.5%) filled in solely the item concerning change in smoking habits during imprisonment. It is worth noting that 80% [116/145, 95% confidence interval (CI): 72.6–86.2%] of the study sample reported current smoking; 43.4% (63/145, 95% CI: 35.2–51.9%) disclosed deterioration in their smoking habits during imprisonment. Smoking-related questions, as well as descriptive statistics for the study sample are presented in table 2.

The unadjusted crude ORs are graphically illustrated in figure 1. In descending order, smoking was significantly associated with parental alcoholism, psychiatric condition in family, physical abuse in childhood, parental neglect, impulsivity, low education, parental divorce, deterioration of smoking in prison and aggression (high BPAQ score).

The results of the hierarchical approach are presented in table 3. Five constituents of adverse childhood history (physical abuse, parental neglect, parental divorce, alcoholism in the family, psychiatric condition in the family) were significant both in adjusted and unadjusted models. On the other hand, among personality traits, impulsivity retained its significance also when adjusted for all statistically significant childhood history parameters, as well as for the immutable demographic factors; interestingly, aggression (both in terms of BPAQ and LTHA measures) and low educational attainment lost their significance after adjustment for the aforementioned sets of covariates ($P=0.619$, 0.755 and 0.106 , respectively).

Concerning prison-related parameters, a trend of borderline significance is worth reporting. After adjustment for all significant childhood- and personality-related parameters (as well as for the demographic features), the effect of

Table 2 Current smoking habits and change in smoking habits during imprisonment in the study sample

Categorical Variables	N (%)
Current smoking habits	
‘I have never smoked’/‘I have quit smoking’	29 (20.0)
<5 cigarettes/day	7 (4.8)
6–20 cigarettes/day	50 (34.5)
21–50 cigarettes/day	39 (26.9)
>50 cigarettes/day	20 (13.8)
Change in smoking habits during imprisonment	
‘quit smoking’/‘have been smoking less frequently’	21 (14.5)
‘have not changed my smoking habits’	61 (42.1)
‘began smoking’/‘have been smoking more frequently’	63 (43.4)
Non-Greek nationality	8 (5.0)
Physical abuse in childhood	30 (20.7)
Parental neglect in childhood	28 (18.7)
Sexual abuse in childhood	2 (1.3)
Parental divorce	33 (21.4)
Alcoholism in family	22 (14.1)
Psychiatric condition in family	13 (8.4)
History of mental disease	38 (26.6)
Low Education	37 (24.3)
Recidivism	53 (43.4)
Continuous measures	mean ± SD (median)
Age (years)	41.7 ± 12.6 (41)
BPAQ score	72.3 ± 22.4 (73)
BIS-11 score	62.0 ± 14.8 (59)
LTHA score	4.5 ± 5.6 (2)
Duration of sentence (months)	15.8 ± 21.2 (10)
Duration of sentence already served (months)	3.0 ± 2.9 (2)

deterioration of smoking during imprisonment remained sizeable, albeit of borderline statistical significance (OR = 2.02, 95% CI: 0.97–4.24, $P = 0.062$).

Discussion

Greece has the highest smoking prevalence among the 27 member states of the European Union.²⁴ Recent studies estimate that 40% of the adult population is daily smokers, with one in two adolescents in certain areas also current smokers, thus rendering the establishment and enforcement of anti-tobacco policies a national priority.²⁵ Prevalence of tobacco smoking among prisoner population in our study was even higher, reaching 80%. Higher prevalence of tobacco smoking among prisoners in comparison with the general population has also been shown in several studies, ranging from 42 to 91%.^{6,26–28}

Although smoking in prison integrated a host of risk factors, the hierarchical approach pointed to adverse childhood events and impulsivity, as the most meaningful risk factors for smoking in prison. Secondarily, deterioration of smoking during imprisonment was a factor with sizeable but statistically borderline effect and seemed thus to contribute to the phenomenon.

Almost all elements of an unfavourable childhood environment, i.e. physical abuse, parental neglect, parental divorce, psychiatric condition in the family, were risk factors for smoking in prison. Although the effects of childhood abuse,^{9,10} parental separation¹² and parental alcohol abuse¹³ have all been recognized as risk factors in the general population or specific subpopulations, this is the first study providing such a straightforward and multifaceted link in prisoners, to our knowledge.

Strikingly, given its considerable effect in terms of odds ratio, alcoholism in the family emerged as a particularly meaningful risk factor, among other adverse childhood events. This may be due to the fact that alcoholism in the family is the condition closest to the notion of an addiction-prone environment; in other words, heavy smoking, having itself features of addiction, may independently trace its roots back to addictive parental behaviors, such as alcoholism. Indeed, parental addiction-prone norms may be directly imprinted in the offspring.²⁹ In addition, parental alcoholism may act indirectly, through childhood abuse which fosters in an alcoholic environment. The underlying genetic component may not be overlooked, as unmeasured genetic components to the relationship between parental alcoholism, adverse childhood experiences in general and smoking may exist.³⁰

Among personality traits, impulsivity appeared as a robust risk factor for heavy smoking; interestingly enough, impulsivity seemed capable of conferring additional risk for heavy smoking even when all unfavorable childhood events were taken into account. It is worth reporting that a two-way association may exist. Smokers are more impulsive through the effects of nicotine;³¹ on the other hand, more impulsive individuals often lack the ability to quit smoking and exhibit frequent relapse.¹⁵

Further commenting on personality traits, it should be noted that aggression and education did not retain their significance after adjustment for adverse childhood events. As a result, and in discrepancy to other studies,¹⁴ this study does not point to aggression as an independent risk factor for smoking. Regarding low educational attainment, it is worth commenting that the loss of significance in the hierarchical approach may be partly due to the relatively limited power of the study; indeed, the adjusted odds ratio was sizeable and the corresponding P -value was nearly within the borderline region. For the optimal interpretation of our results, it should be kept in mind that lower education is a well-acknowledged risk factor for smoking in general community population,³² for both male³³ and female prisoners.²⁷

An intriguing finding of borderline significance is the fact that deterioration of smoking during imprisonment was able to confer additional risk for smoking, even after adjustment for a wide set of childhood- and personality-related parameters. This may imply that imprisonment *per se*, independently of any other described associations is a risk factor for smoking. This elaborate finding is in accordance with all crude, descriptive studies reporting high rates of smoking in prison, as mentioned above.^{6,26–28}

A limitation of this study pertains to the cross-sectional study design. Specifically, although the variables refer to different parts of the prisoners' life course, they have all been measured at the same time; as a result, longitudinal analysis seems necessary to yield stronger evidence. For instance, only longitudinal analysis may shed light into the association of impulsivity with smoking, as the latter could run both ways: from smoking to impulsivity, and from impulsivity to smoking. In addition, the fact that solely a subset of adverse childhood events and parental addictive behaviors have been included in the study; alcoholism in the family was the sole proxy of parental addictive behavior. For instance, neither parental smoking nor parental drug abuse habits have been included in childhood history, although they could have yielded additional information regarding the addictive behavior of parents.³⁴ Nevertheless, given the changes in smoking behaviors and the possibly frequent smoking cessation attempts during lifetime,³⁵ as well as the significant smoking-related recall bias,³⁶ this study did not encompass parental smoking habits in its design. In addition, it is worth commenting that parental alcoholism may encompass a

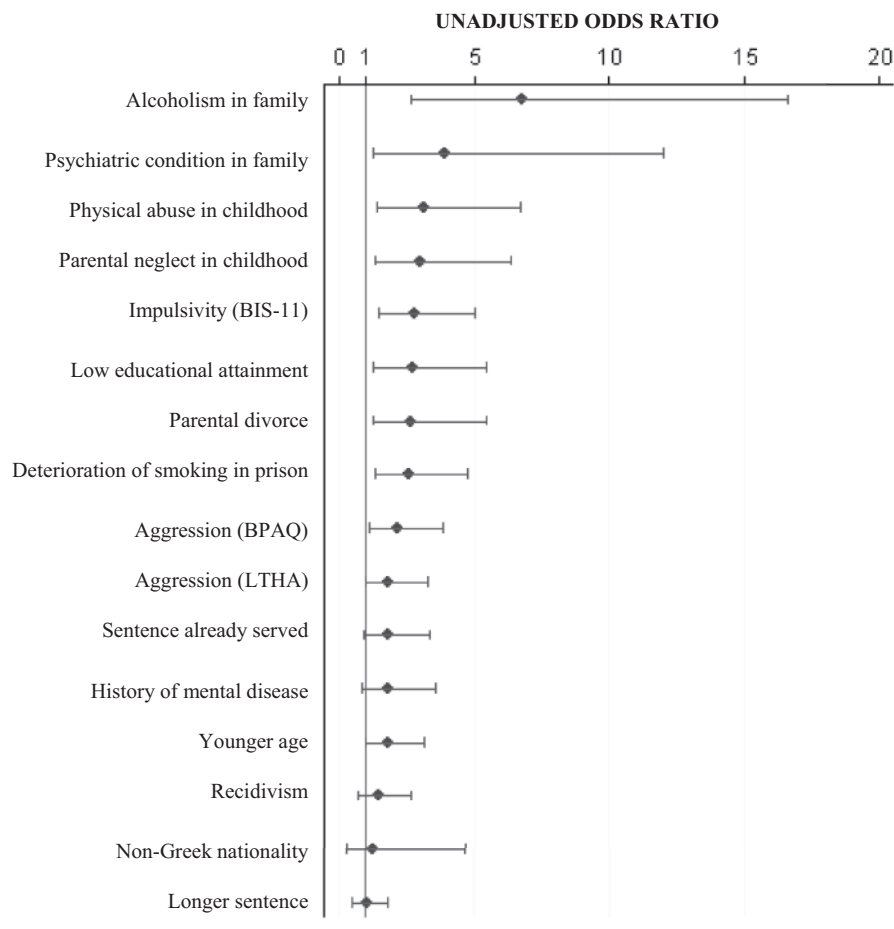


Figure 1 Plot showing unadjusted ORs, as well as 95% CI for risk factors for smoking in prison. Childhood sexual abuse has not been included in the plot due to its extremely large 95% CI (OR=3.74, 95% CI: 0.24–58.75)

Table 3 Results of the hierarchical approach for current smoking

	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Immutable demographic features		
Younger age	1.71 (0.94–3.11) ^a	
Non-Greek nationality	1.16 (0.29–4.62) ^a	
Adverse childhood history		
Physical abuse	3.07 (1.42–6.66)	2.90 (1.30–6.46) ^b
Parental neglect	2.91 (1.34–6.31)	2.66 (1.19–5.95) ^b
Parental divorce	2.58 (1.23–5.42)	2.14 (1.00–4.56) ^b
Alcoholism in the family	6.62 (2.64–16.60)	6.29 (2.44–16.25) ^b
Psychiatric condition in the family	3.84 (1.23–11.99)	4.10 (1.31–12.84) ^b
Sexual abuse	3.74 (0.24–58.75)	3.03 (0.19–49.45) ^b
Education, personality traits and mental health		
Aggression (BPAQ score \geq median)	2.05 (1.11–3.81)	1.21 (0.57–2.60) ^c
Aggression (LTHA score \geq median)	1.74 (0.94–3.25)	1.14 (0.51–2.53) ^c
Impulsivity (BIS-11 score \geq median)	2.67 (1.44–4.97)	2.26 (1.12–4.58) ^c
Low educational attainment	2.61 (1.26–5.38)	1.99 (0.86–4.60) ^c
Personal history of mental disease	1.71 (0.84–3.51)	1.32 (0.53–3.32) ^c
Prison-related parameters		
Deterioration of smoking during imprisonment	2.46 (1.29–4.70)	2.02 (0.97–4.24) ^d
Duration of sentence (\geq median)	0.97 (0.52–1.83)	0.91 (0.43–1.91) ^d
Sentence already served (\geq median)	1.72 (0.88–3.35)	1.37 (0.62–3.03) ^d
Recidivism	1.49 (0.76–2.94)	0.93 (0.38–2.29) ^d

a: only unadjusted ORs are provided, as these variables belong to the first level of the hierarchical model

b: adjusted for younger age and nationality

c: adjusted for younger age, nationality, physical abuse, parental neglect, parental divorce, alcoholism in the family and psychiatric condition in the family

d: adjusted for younger age, nationality, physical abuse, parental neglect, parental divorce, alcoholism in the family and impulsivity

spectrum of conditions whose severity varies; subjectivity of the prisoners' responses may have blurred associations at a certain extent. At any case, the magnitude of the association between parental alcoholism and smoking adds to the validity of the finding.

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Conflicts of interest: None declared.

Key points

- Our study suggests that heavy smoking in prison, having itself features of addiction, may independently trace its roots back to addictive parental behaviors, such as alcoholism.
- Adverse childhood events emerged as risk factors for smoking in prison.
- Impulsivity is capable of conferring additional risk for heavy smoking in prison, independently of adverse childhood events.

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