# Health risk behaviors among high school and university adolescent students

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**Abstract.** Tobacco, alcohol and drug abuse constitute a public health concern. Data regarding health risk behaviors among Greek youth are scarce. The aim of the present study was to investigate health risk behaviors of a large adolescent sample (730 adolescents, 294 males and 436 females), residing in different areas of Greece, trace perceived side effects and associate the findings with the adopted lifestyle. High school students and University newcomers, aged 14-21 years (17.8±4.5 years), self-reported health risk behaviors via an anonymous, closed-type, validated questionnaire. Simultaneous adoption of unhealthy habits, such as smoking and drug abuse, were not independent ($\chi^2$=38.668, P=0.01). Age was the most significant factor in the adoption of unhealthy behaviors; smoking ($\chi^2$=27.220, P=0.01), misuse of cannabis and recreational drugs ($\chi^2$=9.874, P=0.05) and combining alcohol and smoking with entertainment ($\chi^2$=8.708, P=0.05; $\chi^2$=317.309, P=0.05, respectively) were adopted more by the elder (18-20 years) than the younger (15-18 years) teenagers. Males were more prone to abuse of cannabis ($\chi^2$=8.844, P=0.01), whereas females combined drinking and smoking with loud music during entertainment ($\chi^2$=6.618, P=0.05). The majority (64%) reported driving after drinking alcohol and intense entertainment, especially in urban areas. Almost half of smokers (53.1%) and drug users (46.3%) first encountered smoking or drugs from friends. Educational institutions and entertainment venues were the main places of initiation of smoking (26%) or drug use (35.2%), respectively. Adolescents from touristic regions were more prone to smoking (33.9%, P=0.01) and drug abuse (53.7%, P=0.01). The lower the frequency of exercise, the higher the consumption of psychoactive substances (P=0.022). Youth engaging in unhealthy habits were also willing to use prohibited doping substances (56%, P=0.043). Health problems were the main reason to consider changing habits (72%). In conclusion, health risk behaviors were multifactorial and tended to cluster. Thus, preventive youth strategies should target negative peer influences, especially during late adolescence.

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## Introduction

Tobacco use and consumption of alcohol and illicit drugs by adolescents and young people is spreading worldwide and constitutes an important public concern. While the prevalence of smoking among young people is on the decline in many European countries, there is a substantial increase in the developing countries (1,2). In adolescents, the prevalence of smoking has also been reported to be increasingly popular (1). In Central and Eastern Europe the number of smokers among girls and young women is equally on the rise (3). Tobacco use usually starts in adolescence, with typical initial experimentation time

between 11 and 15 years of age (4,5). Smoking experimentation in adolescence confers a significant 16-fold increase in the risk of becoming a smoker in adulthood, when compared to non-smoking adolescents (3). An additional concern over smoking is the so-called 'gateway' effect; it is believed that tobacco use together with alcohol misuse, can lead to the abuse of other drugs (3).

Adolescents are prone to substance experimentation and subsequent use thereof, with the reasons of initiation being multifactorial. Drugs are allegedly claimed between adolescents to provide pleasure, relaxation, surges of exhilaration or prolonged heightened sensation. At the same time, drugs affect the users directly or indirectly, regardless of age, sex, culture, ethnic background, education, or socioeconomic status (6-8). When drugs and alcohol are used as coping strategies, they may be ineffective and exacerbate the problem adolescents are experiencing (6).

Alcohol is particularly attractive to the youth, as it is considered a sign of maturity or adulthood. Inappropriate alcohol use among adolescents has been associated with significant behavioral problems, such as aggressiveness or violent behavior, impaired/unsafe driving with subsequent police arrests, and lethal events, the majority of which are due to motor vehicle crashes, self-injuries and suicide (9).

Therefore, it is of major importance to obtain valid information about the unhealthy habits of young people in order to develop effective intervention programs and focused measures that would prevent adolescents from the initiation and the continuation of any kind of substance abuse. Although many studies have been conducted on smoking and alcohol consumption in adolescence, data regarding Greek youth are limited (10,11). The objective of this study was to investigate health risk behaviors of a large adolescent sample, residing in different areas of Greece, trace any perceived side effects and associate the findings with the adopted lifestyle.

## Materials and methods

*Study participants*. The study population was comprised of high school students and University newcomers students, aged 14-21 years, from different regions of Greece (Athens, Thessaloniki, Corfu, Patras, and Heraklion, Crete). The Research Committee of the Department of Medical Laboratories, Technological Educational Institute of Athens provided approval to conduct the study from April 2009 to April 2011. The original request to participate inn the study was addressed to 15 educational institutions randomly selected from the Ministry of Education list of public schools situated in the selected geographical regions. Permission was granted from the authorities of the educational institutions that participated in the study. The students were asked to answer a validated, anonymous, self-reported questionnaire. The questionnaire was left at the reception desk of the various educational institutions. The questionnaire was accompanied with an explanatory opening page about the survey. Written consent was provided with the return of the completed questionnaire by each study participant. The return rate of the completed questionnaire was 87% among the students of the educational institutions that participated in the study, similar to previous studies (12).

Table I. Demographic characteristics, smoking and training habits of the study population.

| Variables | Study population N (%) |
|---|---|
| Total sample | 730 |
| Age (years) | |
| <15 years | 2[a] |
| 15-18 years | 467 (64) |
| 18-20 years | 260 (36) |
| >20 years | 1[b] |
| Sex | |
| Male | 294 (40) |
| Female | 436 (60) |
| Geographic distribution | |
| Athens | 243 (33) |
| Thessaloniki | 139 (19) |
| Corfu | 149 (20) |
| Patras | 87 (12) |
| Heraklion | 112 (15) |
| Education | |
| Primary | 42 (21) |
| Secondary | 74 (37) |
| Technological | 46 (23) |
| University | 22 (11) |
| Post-graduate | 18 (9) |
| Family status | |
| Only-child | 186 (25) |
| ≥1 brother/sister | 312 (43) |
| Divorced parents | 225 (31) |
| Single-parent family | 99 (14) |
| Smoking | |
| Male | 215 (29) |
| Female | 91 (12) |
| Training habits | |
| During school hours | 299 (41) |
| In private gyms | 199 (27) |
| In sport clubs | 232 (32) |

[a]14-year-old junior high school students from the north suburbs of Athens; [b]21-year-old freshman in Heraklion Medical School.

*Questionnaire*. The study questionnaire was developed by the Department of Medical Laboratories, Technological Educational Institute of Athens and included 22 close-ended questions structured in five sections. The first section addressed social and demographic information, lifestyle and exercise practices; the second assessed the frequency and quantity of use of psychoactive substances (nicotine smoking, cola type drinks/energy drinks/coffee, alcohol, cannabis, recreational drugs, doping substances); the third explored the reasons for undertaking such habits, sources of information/provision and the level of awareness related to possible undesirable health effects; the fourth explored entertainment habits combined with

consumption of psychoactive substances and perceived side effects and the consequences thereof; and the fifth and final one addressed the participants' intention to quit unhealthy habits.

Once the questionnaire was constructed, a multi-disciplinary group of professionals that were not participating in the research group, was asked to review the document and provide input, as previously described (13). This expert group consisted of a toxicologist, an experienced high school teacher, a pediatrician, and a psychiatrist. The group provided input on the general content and face validity of the questionnaire (content validity ratio - CRV = 0.990, P<0.05) (14), which was proven complete and adequate for distribution.

*Statistical analysis*. Statistical analysis was performed using the Statistical Package for Social Science version 22.0 (SPSS Inc., Chicago, IL, USA). Descriptive data are presented as frequencies and percentages. Chi-square ($\chi^2$) tests were computed to reveal independence between supplements use and the categorical study variables (sex, level of education) and Pearson's correlation was performed for continuous variables (i.e., age, exercise years). Significance was set at $P \leq 0.05$.

## Results

*Student demographics*. The study was conducted on 730 adolescents, 294 males and 436 females. A similar ratio of males to females has previously been reported in high school studies in Greece (15). Demographics of the study population are summarized in Table I.

*Behavioral patterns*. The unhealthy behavioral patterns adopted by the study population are shown in Fig. 1. The 53.1% of smokers first encountered smoking from friends, 26% in educational institutions and 16.1% in entertainment venues. Only 1.97% admitted that smoking started in the family, even though 85.4% of smokers came from a smoking family. Regarding drug abuse (8.9% of the study population), 46.3% of users first encountered drugs from friends, 13% in educational institutions and 35.2% in entertainment venues.

Regarding the impact of sex on the adoption of unhealthy habits, adolescent males were found more prone to consume cola-type drinks ($\chi^2$=20.099, P=0.01) and abuse cannabis ($\chi^2$=8.844, P=0.01), whereas females were more used to combining drinking and smoking with loud music during their entertainment ($\chi^2$=6.618, P=0.05).

*Distribution by age of health risk behaviors*. Age was found to be the most significant factor in the adoption of health risk behaviors (Fig. 2). More specifically, older teenagers, aged 18-20 years, were found to smoke more than the younger ones (aged 15-18 years), and this difference was statistically significant ($\chi^2$=27.220, P=0.01). Moreover, drug misuse (cannabis, recreational drugs) significantly depended on the age of responders ($\chi^2$=9.874, P=0.05). The combination of alcohol and smoking with entertainment was more frequently (67%) adopted after the age of 18 years ($\chi^2$=8.708, P=0.05; $\chi^2$=317.309, P=0.05, respectively). Consumption of energy drinks, as well as daily-consumed amounts of coffee seemed to be less affected by the age of the study population and from the demographics in general.

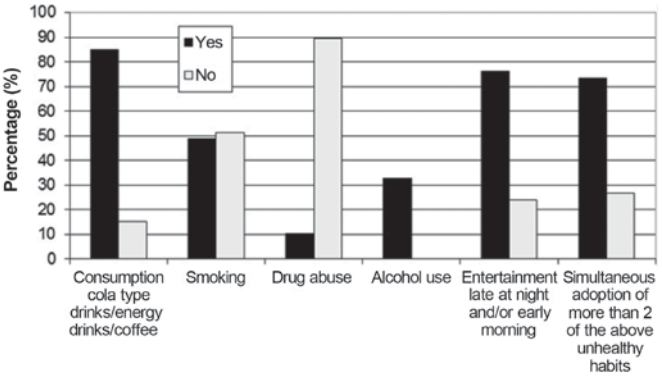


Figure 1. Unhealthy behaviors adopted by the study population.

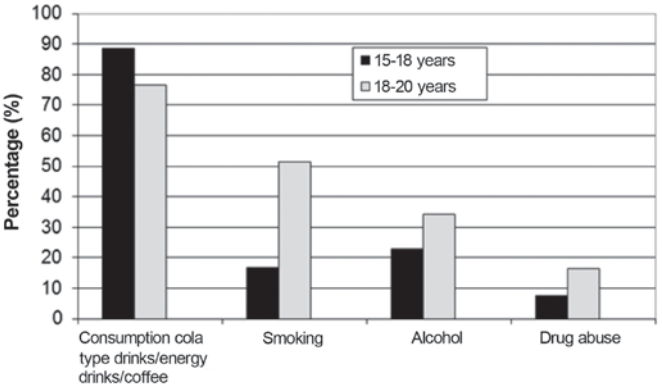


Figure 2. Participants' distribution by age for consumption of cola-type drinks/energy drinks/coffee, smoking, alcohol and drug abuse.

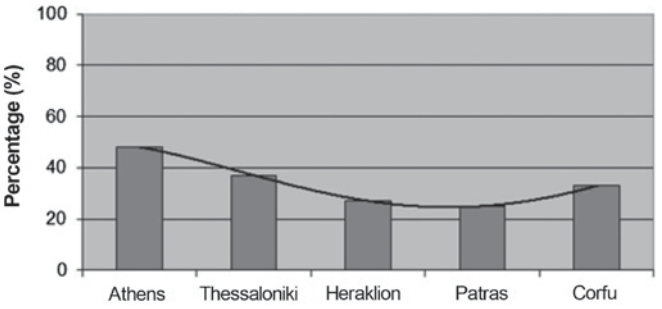


Figure 3. Geographical distribution of the adolescents who combined smoking, alcohol and loud music during their entertainment.

*Geographical distribution for health risk behaviors*. Geographical region played a crucial role in the adoption of unhealthy behaviors (Fig. 3). Specifically, the consumption of cola-type drinks/energy drinks/coffee and the daily-consumed amounts of coffee significantly depended on the region in which respondents lived ($\chi^2$=43.559, P=0.01 and $\chi^2$=78.287, P=0.01 respectively). In addition, smoking ($\chi^2$=14.376, P=0.01), drug abuse ($\chi^2$=26.741, P=0.01) and entertainment habits (drinking alcohol and smoking, $\chi^2$=13.265, P=0.05; loud music, $\chi^2$=34.384, P=0.01) were affected by region. In particular, adolescents from touristic regions, such as Corfu and Heraklion, Crete, were more prone to consumption of caffeine products (33.7%), smoking (33.9%) and drug abuse

Table II. Perceived health side effects by drug abusers.

| Health side effect | Percentage of drug abusers |
|---|---|
| Headache/dizziness | 57 |
| Vomiting | 28 |
| Stomach ache | 19 |
| Gastrointestinal system problems | 13 |
| Earache | 22 |
| All the above | 11 |

(53.7%). Moreover, adolescents from a suburb of Athens, Aigaleo, which is a low-income region with a high percentage of young inhabitants, seemed to easily adopt unhealthy habits related to their entertainment (drinking alcohol and smoking 35.9%, loud music 35.5% and combination of the above 37.8%). In Corfu and Aigaleo, the prevalence of smoking exceeded the average of the study population.

Simultaneous adoption of unhealthy habits, as for example smoking and consumption of cola-type drinks/energy drinks/coffee, were not independent ($\chi^2$=41.121, P=0.01). In addition, 95.3% of those who smoked consumed these types of drinks in parallel, while 54.8% who consumed these types of drinks, also smoked. Simultaneous smoking and drug abuse were also not independent ($\chi^2$=38.668, P=0.01), since 88.9% who used drugs also smoked. Additionally, 75.9% of individuals who used drugs also drank alcohol, smoked and listened to loud music during their entertainment, while 21.8% of those who had these habits during their entertainment, resorted to drug use ($\chi^2$=41.293, P=0.01). Although the majority (59%) of the responders regularly exercised, the lower the frequency of exercise, the higher the consumption of psychoactive substances was (P=0.022). Exercise has been reported to prevent and/or improve a number of health issues through several mechanisms (16). In addition, responders who undertook unhealthy behaviors were willing to use prohibited doping substances (56%, P=0.043).

Side effects reported by the adolescents who adopted unhealthy entertainment behaviors included headache, vomiting, stomachache, earache and intestinal pain. Sixty-seven percent of the study population felt unwell the day after entertainment, while 19% were not affected, with females being more vulnerable ($\chi^2$=8.71, P=0.03). The more vulnerable group regarding health effects was that of drug abusers (Table II).

The 72% reported that their performance the following day was average, 18% reported decreased performance, while none reported very good performance. Age statistically correlated with the participants' perception on their performance based on Pearson's correlation (r=0.587, P=0.001). The 82% believed that they harmed themselves regardless of age, sex and geographical region. Moreover, 62% trusted friends in order to overcome the side effects of the unhealthy habits, 12% trusted their family, 11% trusted their teachers, while only 5% trusted the experts. The 64% of the sample reported driving after drinking alcohol and intense entertainment. The more urban the area was, the more the need for driving was reported.

Eighty-six percent of the study population considered quitting one of the unhealthy habits when becoming older and financially independent, with young males choosing to quit smoking (56%) and drinking alcohol (53%), and young females choosing to quit smoking (62%) and late entertainment (41%). Among those who had admitted to drug abuse, 64% did not seem to realize that they were facing an addiction problem and the vast majority (92%) was willing to quit if their professional engagement required them not to use drugs. Noteworthy, the majority (62%) of the responders believed that increasing exercise activity could help them quit unhealthy behaviors in general. Health problems were the main reason that someone would consider changing habits (72%), while sex ($\chi^2$=19.04, P=0.01) and age (r=0.327, P=0.02) were also significant influences as per Pearson's correlation.

## Discussion

Despite the variety of reports on the negative health effects of smoking, tobacco consumption remains the leading cause of preventable death worldwide (17,18), causing approximately 5 million deaths annually. Every year, more than 25,400 individuals in Greece succumb to tobacco-related diseases, while more than 27,000 children/adolescents and more than 3.5 million adults continue to use tobacco every day (19). Most adult smokers adopt the habit during adolescence (20,21) and the majority of adult daily smokers have smoked their first cigarette before the age of 18 (22). The sex differences in illicit drug use and smoking have narrowed over the years in Greece, especially in the younger age groups, although males remain far more heavily involved in illicit drug use than females (23).

Adolescence is a period of many transitions with physical, cognitive, personal and social status changes. Adolescence is significant in terms of the development of health-related behaviors since it is a time when many new behaviors are explored, some of which may become established and continue into adulthood. Experimentation with alcohol, tobacco and illicit drugs are among the behaviors often initiated during adolescence (24). The prevalence of smoking and illicit drugs abuse in our study were similar to the results of the Greek Nationwide School Population Survey 1894-2015 on Substance Use and other Addictive Behaviours (12). Our findings highlighted that late adolescence is a key age in adopting unhealthy habits and behaviors such as smoking, drug use as well as drinking in combination with smoking during entertainment (15).

Family, friends, school, as well as intrinsic factors, such as mental disorders, increase significantly the risk of psychotropic drug use during adolescence. The family's social conditions, such as poverty, living in an area of violence, the lack of an extended family or community support network, all act in favor of substance addiction (25). Moreover, attendance to social norms and peer influence are among the most prominent explanations for adolescent health risk taking (20). In our study, the main factor influencing the initiation of smoking and drug use was friends. Interestingly, although 85.4% of smokers came from smoking families, only a small percentage (1.9%) of the study sample started smoking in family. This may indicate that parents acted as role models and Greek youth adopted unhealthy habits, in order to imitate their parents, even subconsciously, and in order to gain peer

acceptance. Our results are in accordance with other studies showing that friends and family play an important role in the initiation of smoking (26,27).

According to the WHO estimates, in Europe and other developed countries, alcohol and tobacco account for a much larger proportion (>21%) of disease and disability than illicit drugs (<2%) (28,29). Greece is a tobacco- and alcohol-producing country and thus the use of these substances is widespread and socially accepted. The educational institutions rather than entertainment venues were the main places for adolescents to initially encounter smoking in accordance with previous studies (30). Although smoking is forbidden in schools, it is not banned in Universities or private colleges in Greece.

On the other hand, drug use was initiated in entertainment venues rather than in educational institutions. Although the availability of illicit drugs is rather high due to the fact that Greece is a pathway for the illicit trade between Asian countries and the West, the use of cannabis and other illicit drugs is considered as criminal behavior and subject to severe penalties. Nevertheless, strict regulations for prescribing and purchasing psychotropics have been strongly implemented only recently (10,11).

In the present study, the geographical area significantly affected the adoption of unhealthy behaviors with Corfu, a holiday resort at the western border of Greece, and thus an entrance gate to Greece, presenting increased rates of illicit drugs misuse, smoking and consumption of coffee drinks. Furthermore, in Aigaleo, a low-income suburb of the capital of Athens, young people easily adopted health risk behaviors regarding their entertainment. Previous results from rural areas in Greece demonstrate a similar pattern (30,31).

Following unhealthy entertainment behaviors, 67% of the sample felt unwell or were negatively impacted, with females reporting the worst side effects. Adolescents who resorted to family or teachers were mainly (36%) those who suffered undesirable effects from the unhealthy entertainment rather than those who had implications from drug use. It has previously been reported that adolescents with smoking and/or binge drinking practices reported higher levels of psychosomatic symptoms compared to peers with no experiences of such health-risk behaviors (32). Although a high percentage (82%) believed that these behaviors were harmful and were positive (86%) in intending to quit any of these behaviors, the majority (72%) reported that they would actually terminate the unhealthy habits when a health issue arose. This might suggest the lack of valid information and effective health risk education in youth.

This study has some limitations. Data collection relied exclusively on self-reported questionnaires, which may have introduced bias. On the other hand, this anonymous self-reported method, allowed participants to reveal illegal behaviors and feelings that might have not been reported otherwise. Participants resided in different regions of Greece. Nevertheless, the study sample was not representative of the entire adolescent population of the country and therefore generalization of the findings of this study to other adolescent populations is limited.

In conclusion, results of the present study support the already known tendency of risky behaviors to cluster (33). In agreement with international data adolescents were more susceptible to peer group and other social influences, with the age of 18-20 years being more critical for adoption of the unhealthy behaviors. Effective preventive youth strategies targeting simultaneous adoption of unhealthy habits and negative peer influences in late adolescence could potentially decrease the future population of adult smokers and alcohol and drug dependents (34).

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**Availability of data and materials**

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Authors' contributions**

CT developed, planned and supervised the project, contributed in the development of the questionnaire and was a major contributor in writing the manuscript. KT developed the questionnaire, supervised the data entry and evaluation, performed the statistical analysis and was a major contributor in writing the manuscript. FV performed data entry and evaluation and was a major contributor in writing the manuscript. PP contributed in developing the project and in the development of the questionnaire, collected the questionnaires and performed data entry. GD collected the questionnaires and performed data entry. AC contributed in the development of the questionnaire, planned the collection sites and supervised the collection of the questionnaires. DAS and AT reviewed the questionnaire and supervised the procedure for the validation of the questionnaire. EC contributed in the planning and the supervision of the project. FB contributed in the development of the project and in the development of the questionnaire, supervised the project and was a major contributor in writing the manuscript. All authors read and approved the final manuscript.

**Ethics approval and consent to participate**

Not applicable.

**Patient consent for publication**

Not applicable.

**Competing interests**

Demetrios A. Spandidos is the Editor-in-Chief for the journal, but had no personal involvement in the reviewing process, or any influence in terms of adjudicating on the final decision, for this article.

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