SHORT PAPER

Survey on Energy Drinks consumption and related lifestyle among students of two Italian high schools

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Parole chiave: Energy drinks, Stili di vita adolescenziali, Alcol, Caffeine, Sport

Abstract

Background. The European Food Safety Authority (EFSA) has identified some risk factors for the occurrence of side effects linked to energy drinks (EDs) consumption by young people. EDs consumption has been evaluated in a sample of students in Italy together with some aspects of their lifestyle.

Methods. The survey was performed in two high schools from September 2016 to June 2017. 583 students between 14 to 18 years were recruited and a standard questionnaire (EFSA checklist) was used to collect information on responders characteristics, beverages consumption, EDs with alcohol, and EDs and sports.

Results. Despite 350 out of 583 responders (60%) consumed EDs, only 146 out of 583 (25%) were EDs-alcohol consumers. Moreover, 208 out of 379 (55%) of all physically active adolescents reported frequent EDs consumption before sport trainings.

Conclusions. Study results highlight the need for primary prevention measures in communication campaigns and training delivered by school to limit potential health threats related to excess of EDs consumption.

Introduction

During the last decades Energy Drinks (EDs) have become a popular beverage worldwide (1, 2) and represent one of the most rapidly growing segments of the beverage industry and soft drink market (3). EDs consumption has increased in 18–35 years old young adults, mostly among athletes and students. Some studies show that adolescents and young adults consume EDs to increase their alertness, physical and mental energy and to improve mood (1-5). In particular, 5% of young people consume EDs on a daily basis, while 30–70 % of adolescents drink these beverage less frequently. College and university students use energy drinks at least once a month to compensate for insufficient sleep, also mixing them with alcohol during parties. Other studies report that female students drink more energy beverages than male (6-10).
Energy drinks are composed of a combination of stimulants as caffeine, amino acids such as taurine, sugar derivatives, including glucuronolactone, amino acid derivatives such as carnitine, herbal extracts such as guarana, ginseng, B vitamins, etc (10, 11). EDs may contain excessive amounts of caffeine, from 75 to 125 mg per can, and could cause cardiovascular effects, the alteration of endothelial function, the increase of anxiety, heart rate, systolic blood pressure, ventricular tachyarrhythmias and abnormalities of cardiac repolarization time as measured by the QT interval (12-20).

The consumption of energy drinks is widely spread among physically active people. These beverages may be considered a source of stamina and refreshment for young athletes performing matches or training sessions in the evening. Young people are targeted by energy drink sponsorships during sports events, promoting physically active people’s belief of an increase in endurance and invincibility. Therefore, EDs are considered as functional beverages appropriate to drink during sports and designed to increase physical and mental performance (21-25).

Many studies show that almost 25% of university students usually mix alcohol with EDs since both are meant to have anti-depressive properties. This promotes the increase of risks because this mix reduces the perception of intoxication and induces the belief of not being totally drunk. Furthermore, kids who try EDs early will be more likely to become frequent consumers and mix them with alcohol (22, 26-28).

The issue of EDs consumption has been widely discussed in Europe. From 2001, The French Agency for Food, Environmental and Occupational Health & Safety reported a negative opinion on the consumption of these drinks for their potential toxic effects caused by taurine and glucuronolactone (29). In 2012 the European Food Safety Authority (EFSA) highlighted all risks related to EDs consumption in association with alcohol and sport activities. A study commissioned by EFSA and Consortium NOMISMA-ARETÉ showed a large EDs consumption in adults, adolescents and children groups analyzing people lifestyle through a questionnaires-based survey involving more than 50,000 participants from 16 different EU Member States. The data proved an extensive EDs and alcohol consumption in adolescent groups (7).

Based on existing literature, the purpose of this study is to evaluate young people lifestyles related to EDs consumption and to assess if the assumption of energy beverages is a common habit among adolescents in our geographical area.

**Methods**

From September 2016 to June 2017 a survey was performed enrolling 583 adolescents aged from 14 to 18 years during school lessons in accordance with teachers and school principals. The two investigated schools are located in two different Tuscan cities: Lucca and Pisa (Italy) and have represented a convenience sample. This study used data that were obtained from student answers provided in EFSA questionnaire. We did not make any changes to the document. After the school councils we obtained a written study consent by parents, teachers and heads of schools. Participants and all involved people were informed of study aims before agreeing to participate. They were free to refuse or withdraw from the study.

Moreover, in June 2016 we submitted the issue at the Ethical Committee of our hospital and it did not prevent our “not clinical” experimental study already validated by the EFSA Institution.

The EFSA questionnaire (7) was submitted to all responders during the school years 2016-2017. The checklist was organized in four principal sections.

The first section was called “Responders Informations” and aimed at collecting
personal characteristics of respondents, as age, gender, address, education and training.

The second section was divided in “Beverages Consumptions”, aiming at understanding people habits and their relationship with all kind of beverages; and “EDs Consumptions”, aimed at investigating EDs consumption levels and the reasons for drinking these beverages. This section collected information on consumption of generic beverages and EDs in different times: during sport, at home, during parties etc.

“EDs with Alcohol” was the third checklist section, which assessed consumption of EDs associated with alcohol both during parties and in other occasions. This section allowed to understand alcohol and EDs addiction in young people.

The last section, called “EDs and Sports”, investigated EDs consumption among adolescents physically active and why sportive adolescents requested EDs use.

Statistical analysis was performed using the software XLSTAT (ver. 2016.03.30523). The Pearson $\chi^2$ test was employed to assess differences in the distribution of frequency of replies and the Fisher exact test where the frequencies were small. A value of $p<0,05$ was considered significant.

**Results**

**Participants data and EDs consumption**

All students agreed upon the study participation. Out of 583 participants, 360 attend high school in Lucca, while 223 people attend high school in Pisa. Overall, 51% (299/583) of the students are male and 49% (284/583) are female. No participant is affected by chronic disease or other physical and behavioral disorders.

During the day 91% (530/583) of respondents regularly drink water, but a little percentage of students from Lucca reports regular consumption of carbonated EDs or fruit juice during the day. Description of EDs consumption is shown in Table 1.

233 out of 583 responders (40%) never consume energy drinks because of their nasty flavor and nutritional parameters. 70 out of 583 (12%) often drink EDs beverages, while 280 out of 583 (48%) occasionally consume EDs either during parties or other fun opportunities during the night. Among all participants 70 out of 583 (12%) consume EDs several times a week, mostly young athletes performing matches or training sessions during the evening. Therefore, only 14% of all EDs consumers (49/350) results to have consumed these beverages during the last 3 days. More than 15% of respondents needs from 1 to 5 EDs cans a week to increase physical and mental performance. Moreover, 25 out of 350 people (7%) consume more than 3 EDs cans at the same time.

<table>
<thead>
<tr>
<th>Results</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>51% (299/583)</td>
</tr>
<tr>
<td>Female</td>
<td>49% (284/583)</td>
</tr>
<tr>
<td>Percentage never water consumers</td>
<td>9% (53/583)</td>
</tr>
<tr>
<td>Percentage of people who regularly drink water</td>
<td>91% (530/583)</td>
</tr>
<tr>
<td>Percentage of people who consume EDs</td>
<td>60% (350/583)</td>
</tr>
<tr>
<td>Percentage of people who often consume EDs</td>
<td>12% (70/583)</td>
</tr>
<tr>
<td>Percentage of people who occasionally consume EDs</td>
<td>48% (280/583)</td>
</tr>
<tr>
<td>Percentage of people who never consume EDs</td>
<td>40% (233/583)</td>
</tr>
<tr>
<td>Percentage of people who have consumed EDs in the last 3 days</td>
<td>14% (49/350)</td>
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<tr>
<td>Percentage of people who have consumed EDs in the last year</td>
<td>60% (210/350)</td>
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<tr>
<td>Percentage of people who usually consume 3-5 EDs cans in a week</td>
<td>16% (56/350)</td>
</tr>
<tr>
<td>Percentage of people who usually consume over 3 EDs cans at the same time</td>
<td>7% (25/350)</td>
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</tbody>
</table>
Investigating on the reasons why people consume EDs, we gathered up information that EDs consumers need to compensate for insufficient sleep. Furthermore, people choose beverages with added sugar to get a better flavor. Our statistical results showed that ED consumption did not differ significantly ($p = 0.52$) between female and male responders, and it is the same either they come from Pisa or Lucca ($p = 0.70$).

**EDs and alcohol consumption**

A large percentage of our sample (437/583, 75%) drink alcoholic beverages (spirits, beer and wine) or soft drinks during parties, while 146 out of 583 (25%) of people consume EDs with alcohol in these occasions. Among all EDs-alcohol consumers, 56% (82/146) mix alcohol and EDs at the same time or in the same glass: 23 out of 82 (28%) drink mix of alcohol and

![Figure 1 - Percentages of young people who consume EDs with alcoholic beverages.](image)
EDs from 1 to 3 times a month; 56 out of 82 (68%) consume these mix beverages from 4 to 8 times a month and 3 out of 82 (4%) drinks mix beverages from 9 to 12 times a month (Figure 1). The habit of mixing EDs with alcohol has no significant differences between males and females (p = 0.25) and between Lucca and Pisa (p = 0.64).

EDs consumption during sports

Among all responders 379 out of 583 (65%) usually practice sport activities during the week. Among physically active people, 171 out of 379 (45%) never consume EDs before sport sessions; 170 out of 379 (45%) often need EDs before sport trainings; 38 out of 379 (10%) regularly consumes EDs.

Figure 2 - Percentages of young people who consume EDs during sport activities.
before sport activities. A large percentage of responders highlight the importance of EDs consumption to increase endurance, physical and mental performance during matches or sport trainings. Among the 208 physically active adolescents consuming EDs, 166 (80%) drink only 1 can per each sport session, 23 (11%) need at least 2 EDs cans for a single sport session and 19 (9%) drink more than 2 EDs cans during a single sport match (Figure 2). No difference in frequency of practicing sports was observed between male and female (p = 0.64). Furthermore, little association among people practicing sports and those consuming EDs was also observed (p = 0.76). Such evidence was the same whether the population come from Lucca or Pisa (p = 0.97) and whether they were females or males (p = 0.17). Among all 379 sportive students a higher EDs consumption before sport trainings was observed in female people (p = 0.033).

Discussion and conclusions

During the recent years some institutions as European Universities, Superior Health Council of Belgium, ANSES, the European Food Safety Authority, the European Center for monitoring Alcohol Marketing, among others, have carried out a wide range of research surveys to evaluate the risk related to EDs consumption by European young people (30-32).

EFSA checklist was submitted to adolescents to study young people lifestyles and to know all possible hazards related to EDs, drunk with or without alcoholic beverages, in different times of the day (7).

Our research, that involved a limited student sample in two Italian high schools, shows overall EDs consumption by 60% of the sample. Despite 146 out of 583 people (25%) resulted EDs-alcohol consumers, only 70 out of 583 of adolescents (12%) have been shown to be habitual EDs consumers. Therefore chronic assumption of energy beverage is not a common habit among Italian young people yet.

Epidemiological data obtained from the Food and Drug Administration show deaths cases related to caffeinated and energy drinks consumption. Since 2004 a total of 34 deaths have now been linked to energy drinks worldwide. France and United States of America are the most involved nations (33).

No death cases are recorded in Italy and this is due to different drinking habits and regulations compared to other nations. More than 130 American EDs contain a caffeine concentration higher than the recommended amount in Italian beverages. The EU Regulation 1169/2011 (34) introduced the obligation of the nutrition facts label for the pre-packaged food, aimed to protect public health. Therefore, the Italian Antitrust Authority has prompted the EDs companies to avoid dangerous behaviors such as the concomitant assumption of EDs and alcohol by young people. On the other hand, the easy availability of energy beverages represents a barrier to implement the limits established by national authorities. Our preliminary research add some evidence in suggesting the need for primary prevention activities in order to ensure people’s awareness about all risks related to EDs consumption, mostly associated with alcohol and during physical activities. This kind of prevention needs further specific programs and regulatory interventions to promote public health. Some lifestyles and eating habits may be changed thanks to education plans carried out by a school health team (teachers, physicians, nutritionists, social networks), remarking issues as the alcohol abuse and EDs consumption, often underestimated by Italian public institutions and schools.

Acknowledgments

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Survey on Energy Drinks consumption among Italian students

Riassunto

Sorveglianza sul consumo di Energy Drinks e sui relativi stili di vita da parte degli studenti di due licei italiani.

Obiettivi. L’Autorità Europea della Sicurezza Alimentare (EFSA) ha identificato alcuni effetti avversi legati al consumo di energy drinks (EDs) da parte degli adolescenti. Il consumo di EDs da parte della popolazione giovanile e i loro stili di vita sono stati studiati in un campione di studenti italiani.

Metodi. La sorveglianza è stata condotta in due licei nel periodo che va da Giugno 2016 a Giugno 2017. 583 studenti dai 14 ai 18 anni sono stati sottoposti alla compilazione di un questionario elaborato dall’EFSA, il quale è stato utilizzato per raccogliere informazioni dei partecipanti sulla tipologia di bevande assunte, con riferimento al consumo di EDs associato all’alcol e all’attività sportiva.

Risultati. Sebbene 350 su 583 rispondenti (60%) consumino EDs, solo 146 su 583 (25%) lo associano all’alcol. Inoltre, 208 su 379 (55%) dei partecipanti fisicamente attivi riportano un frequente consumo di EDs prima delle sessioni sportive.

Conclusioni. I risultati evidenziano la necessità di misure preventive primarie tramite campagne e corsi educativi sostenuti dalle scuole in modo da limitare i potenziali rischi associati all’eccessivo consumo di EDs.

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