

# Knowledge Towards Energy Drinks Consumption and Related Factors Among Young Male Athletes in the United Arab Emirates

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## Abstract

**Objectives:** We aim to investigate the knowledge towards Energy Drinks (EDs) consumption and related factors among young male athletes in the United Arab Emirates (UAE).

**Subjects and Methods:** A cross-sectional study included 688 young male athletes from Al Ain sports club aged between 7 to 18 years. Data were collected using a modified version of a validated questionnaire from the European Food Safety Authority.

**Results:** Overall EDs consumption was 24%. About 44% of the athletes consumed EDs one to two times per month. Athletes who were training between 5–7 days per week consumed significantly more EDs compared to those who were training 3–4 days per week (81% vs. 15 %,  $P<0.001$ ). Athletes aged 7–12 years were 2.4 times more likely to consume EDs than athletes aged 13-18 years ( $P<0.001$ ). Moreover, athletes living with both parents were significantly less likely to consume EDs compared to those living with a single parent ( $P=0.01$ ). Knowledge score about EDs consumption was significantly higher for non EDs consumers compared to EDs consumers ( $P<0.001$ ).

**Conclusions:** EDs consumption among young male athletes was moderate. Educational programs are needed to increase the awareness regarding EDs consumption and its potential adverse effects among the young athletes. A regulation policy for EDs consumption should be addressed and consideration of labels with EDs contents and age identification is highly recommended.

**Keywords:** adolescent, athletes, consumption, energy drinks, knowledge

## 1. Introduction

Energy Drinks (EDs) has become one of the most popular beverages worldwide. They are defined as any type of non-alcoholic beverages that contains caffeine as a main ingredient, taurine, vitamins, and other ingredients combination (such as guarana and ginseng, etc.) (Metrology, 2015; Zucconi, 2013). They are marketed as to relieve fatigue and improve mental alertness, in contrast with sports or isotonic drinks which are intended to help athletes rehydrate after exercise (Campbell et al., 2013; Schneider & Benjamin, 2011). EDs marketing targets athletics as the primary target population, but as the expanding of EDs marketing into a different niche, teenagers and young adults are today the target population for EDs consumption as this group is more attracted to advertisements of these type of products (Heckman, 2010; Lal, 2007).

Many reports on the adverse effects of EDs consumption have been received by poison control centers and regulatory authorities (Ali, Rehman, Babayan, Stapleton, & Joshi, 2015; FDA, 2012; Gunja, 2012; Seifert, Schaechter, Hershorin, & Lipshultz, 2011). These reports included cardiac, neurological and gastrointestinal adverse effects. An excess amount of caffeine can lead to many negative health effects such as sleep disturbance, anxiety, jitteriness, gastrointestinal effects, tachycardia, and other cardiac symptoms and in some rare cases seizures and death (Harris & Munsell, 2015; Reissig, Strain, & Griffiths, 2009; Seifert et al., 2011). According to the U.S. Food and Drug Administration (FDA), the higher limit of moderate caffeine consumption among healthy

adult people is 400 mg/day (FDA, 2018). Health Canada issued recommendations for maximum caffeine intake levels for children aged 4 to 12 years to be between 45–85 mg caffeine per day and for children aged 13 years and above caffeine consumption should not exceed 2.5 mg/kg/day (Canada, 2012).

Data from the European Food Safety Authority (EFSA) showed that the consumption of EDs was 68% among adolescents, 30% among adults and 18% among children (<10 years old) (Zucconi, 2013). O'Brien et al. found that 34% of EDs consumers were aged between 18 to 24 years in the USA (O'Brien, McCoy, Rhodes, Wagoner, & Wolfson, 2008). Moreover, Gallimberti et al. reported a significant increase in EDs consumption from 18% among sixth grade to 56% among eight-grade adolescent students (Gallimberti et al., 2013). EDs consumption among college students in the United Arab Emirates (UAE) was reported to be 92% (Shery Jacob, 2013). There is a scarcity of studies on EDs consumption among young athletes. We aimed to investigate the knowledge towards EDs consumption and related factors among young male athletes in the UAE.

## 2. Materials and Methods

### 2.1 Study Protocol

This cross-sectional study was carried out during the period from May to October 2017 among young male athletes in Al Ain Sports Club, Al Ain city, Abu Dhabi, UAE. A convenient sample of total of 688 male athletes aged between 7 to 18 years from different sports disciplines were selected.

A structured and validated questionnaire of 37 questions was created based on a previously validated questionnaire used for gathering consumption data on specific consumer groups of EDs by the European Food Safety Authority (EFSA) (Zucconi, 2013). The questionnaire was modified and adapted to our culture and objectives and was administered in both English and Arabic. It was translated from English to Arabic and back-translated. The questionnaire was reviewed by three other nutritionists and pilot tested on 27 young athletes to ensure the validity and clarity of the questions.

This study is approved by Al Ain Medical District Human Research Ethics Committee (CRD504/17, Protocol No.17–27). The consent was obtained from the participant's parent. All study data and participant's information were handled confidentially and coded, and no one but the research team from the Community Nutrition Department had access to it.

### 2.2 Data Collection Tools

The questionnaire consisted of 6 sections: section (1) demographic data (gender, age groups (7–12 years and 13–18 years), weight, height, general health status and family type (living with both parents, single parent, other), average sleeping duration during weekdays (<7 hours, 7–9 hours, >9 hours), Type of sports: team sports (football, basketball, handball, volleyball) or individual sports (swimming, JiuJitsu); (2) overall beverages consumption; (3) EDs consumption frequency (during the past 3 days and the past year), can size, location, reasons for consumption, preferred brand, choice of sugar or sugar free, parental EDs consumption; (4) Physical Activities (PA) [exercise frequency (5–7 days per week, 3–4 days per week, 1–2 days per week), EDs consumption before/during/after exercise and number of cans per session]; (5) Other caffeinated beverages (coffee, tea, hot chocolates, and cola) consumption frequency, cup or can size and caffeine and sugar choice; (6) knowledge about EDs price, caffeine and vitamins contents.

Each athlete was interviewed face-to-face by a nutritionist. Pictures and samples of EDs products with all available sizes were used during the interview. Body Mass Index (BMI) of the athletes were measured and calculated as weight in kilograms (kg)/ (height in meter)<sup>2</sup>. BMI was classified according to the Centers for Disease Control and Prevention (CDC) Growth Charts into underweight (less than 5<sup>th</sup> percentile); healthy weight (5<sup>th</sup> percentile to the 85<sup>th</sup> percentile); overweight (85<sup>th</sup> percentile to less than the 95<sup>th</sup> percentile) and obese (equal to or greater than the 95<sup>th</sup> percentile). (CDC, 2015)

### 2.3 Statistical Analysis

Data from all the questionnaires were coded and entered using SPSS (Statistical Package for the Social Sciences, version 23). Descriptive and frequency analysis was used to analyze the baseline athletes characteristics. Pearson  $\chi^2$  test was used to assess differences in the distribution of frequency of replies and to analyze the influence of selected related factors (BMI categories, family type and frequency of PA) on overall EDs consumption). Logistic regression was performed to test the effects of various factors (age group, family type, average sleeping hours per weekdays and frequency of PA) on overall EDs consumption.

For each athlete, a knowledge score (K score) ranging from 4 to 8 was calculated based on the number of the correct answers to four questions. The higher the score, the lower the knowledge towards EDs. Independent t-test

was used to test if the K score means differs based on overall EDs consumption. Simple linear regression was used to study if a K score can predict overall EDs consumption, age groups, and family type. In our study, the significant criteria were set at  $P < 0.05$  and were used for all the statistical analysis.

### 3. Results

#### 3.1 Athletes Characteristics

Table 1 describes athletes sociodemographic characteristics according to EDs consumption. The study included 688 male athletes (mean age  $11.5 \pm 2.5$  years, mean BMI  $= 19 \pm 4.1$  kg/m<sup>2</sup>). Among all athletes, 21% were either overweight or obese. Around 87% of all the athletes lived with both parents and 12% lived with a single parent. The majority of the Athletes reported no health problems (92%).

Table 1. Athletes characteristics as related to EDs consumption (n=688) \*\*

Socio-Demographic data	Overall EDs consumption		
	Yes n (%)	No n (%)	Total n (%)
<b>Age groups (Years)</b>			
7-12	69 (42)	371 (58)	440 (64)
13-18	94 (71)	150 (29)	244 (36)
<b>BMI (kg/m<sup>2</sup>)</b>			
Underweight	12 (9)	29 (6)	41 (6)
Normal	95 (69)	309 (68)	404 (59)
Overweight	17 (12)	70 (15)	87 (13)
Obese	13 (10)	49 (11)	62 (9)
<b>Family type*</b>			
Both parents	133 (82)	468 (89)	601 (87)
Single parent	28 (17)	56 (11)	84 (12)
Other	2 (1)	1 (0.2)	3 (0.4)
<b>Average sleeping weekdays (hours)</b>			
< 7	38 (23)	50 (10)	88 (13)
7-9	101 (62)	332 (63)	433 (63)
> 9	24 (15)	142 (27)	166 (24)
<b>Type of sports</b>			
Team sports	139 (85)	462 (88)	601 (87)
Individual sports	24 (15)	63 (12)	87 (13)
<b>PA frequency*</b>			
1-2 days/week	7 (4)	50 (11)	57 (8)
3-4 days/week	24 (15)	120 (26)	144 (21)
5-7 days/week	132 (81)	295 (63)	427 (62)

Note. BMI= body mass index, PA= physical activities.

\*\*Some values were missing for some variables.

\*Significant  $P < 0.05$ .

Interestingly, athletes living with both parents consumed significantly fewer EDs (89%) as compared to athletes living with a single parent (11%,  $P=0.01$ ). Moreover, athletes who trained between 5-7 days per week consumed significantly more EDs compared to those who trained between 3-4 days per week (81% vs. 15%,  $P < 0.001$ ), Table

1.

### 3.2 Energy Drinks Consumption

In our study, the overall EDs consumption among young male athletes was 24% (n=163). The majority consumed at least one can once or twice per month (44%). 22% of athletes parents consumed EDs sometimes, the majority (16%) were athletes fathers. In terms of the preferred brands, two brands of the tested emerged to capture market share of over 80%. The most popular brands of EDs were Redbull (54%) and PowerGold (29%). The majority of athletes consumed 250 ml EDs can size (87%). The main reasons for EDs consumption by the athletes were its good taste (54%), energy/performance enhancement (19%), and friends influence (20%), Figure 1. Regarding EDs consumption as related to PA, 17% of athletes reported never consumed EDs during PA, 5% reported sometimes consumed before and/or after or during PA, 2% reported EDs consumption always before or after PA.

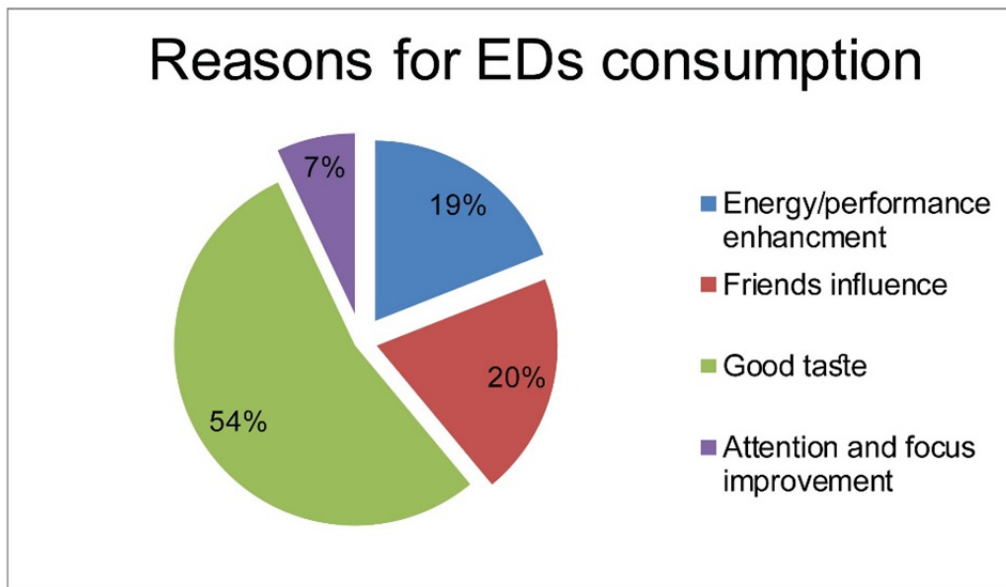


Figure 1. Reasons for Energy Drinks consumption among young male athletes

### 3.3 Overall EDs Consumption and Related Factors

Age and sleeping hours were significant predictors to EDs consumption, Table 2. Athletes aged 7–12 years were 2.4 times more likely to consume EDs than athletes aged 13–18 years after controlling for all other factors in the model. Additionally, athletes sleeping between 7–9 hours and those more than 9 hours were more likely to consume EDs compared to athletes sleeping less than 7 hours (Table 2). A Pearson correlation analysis showed a positive correlation between EDs consumption and average weekdays sleeping hours ( $r = 0.186$ ,  $n = 687$ ,  $P < 0.001$ ). On the other hand, a negative correlation was shown between age groups and EDs consumption ( $r = -0.257$ ,  $n = 684$ ,  $P < 0.001$ ).

Table 2. Logistic regression of overall EDs consumption with selected variables (n=624)

Variables	OR	95% CI
<b>Age groups (years)</b>		
13-18 (ref)		
7-12	2.38	1.56, 3.63*
<b>Family type</b>		
Both parents (ref)	0.6	0.35, 1.02
Single parent	0.25	0.02,3.6
Others		
<b>Average sleeping weekdays (hours)</b>		
<7 (ref)	1.73	1.04, 2.89*
7-9	2.31	1.19, 4.52*
>9		
<b>PA frequency</b>		
5-7d/week (ref)		
3-4d/week	1.55	0.92, 2.62
1-2d/week	2.02	0.86, 4.74

Note. OR= Odds Ratio; CI= Confidence Interval; PA= physical activities.

\*Significant  $P < 0.05$ .

### 3.4 Knowledge Towards Overall EDs Consumption

Around 82% of the athletes didn't know that EDs contained caffeine and only 20% believed that EDs contained vitamins. The majority of athletes (76%) assumed that EDs and soft drinks are different.

The average knowledge score (K) of EDs consumption among all the athletes was  $6.5 \pm 0.96$  ( $n = 687$ ). We found that K score was significantly higher for non EDs consumers  $6.6 \pm 0.96$  ( $n = 524$ ) compared to K score for EDs consumers  $6.05 \pm 0.88$  ( $n=163$ ) ( $P < 0.001$ ). These results suggest that athletes who were not consuming EDs had lower knowledge towards EDs consumption.

EDs consumption and age groups were significant predictors of K score as described in Table 3. These results suggest that as the age increases, knowledge towards EDs increases and as the overall EDs consumption increases, knowledge towards EDs decreases.

Table 3. Multiple linear regression of K score with related factors

Variables in the model	b	SE b	$\beta$	95% CI
<b>Overall EDs consumption</b>	0.24	0.044	0.213	0.16,0.33*
<b>Age groups</b>	-0.21	0.078	-0.102	-0.36,-0.054*
<b>Family type</b>	-0.038	0.103	-0.014	-0.24,0.17

Note. b and SE b = unstandardized coefficient and its standardized error;  $\beta$  = the standardized coefficient; CI = Confidence Interval

\*Significant  $P < 0.05$ .

## 4. Discussion

This study reported that overall EDs consumption among male athletes aged 7 to 18 years was 24%. Forty-four percent of athletes in this study reported EDs consumption 1-2 times per month. Similarly, The EDs consumption among adolescents in Bahrain was 2 to 3 times per week (28.8%) and 1-2 times per month (15%) (Maryam, 2015).

While lower EDs consumption rate was reported among adolescents aged 11-13 years old in Italy (20%) (Gallimberti et al., 2013). Musaiger et al. (Musaiger & Zagzoog, 2013) reported that about 55% of adolescents consumed EDs once or more each week. In our study, it has been found that athletes aged 7-12 years were more likely to consume EDs than athletes aged 13-18 years. Similar to other, our study showed that the consumption rate decline with increased age (Simon, 2007). In contrast, Gallimberti L. et al. (Gallimberti et al., 2013) demonstrated that EDs consumption increased steadily with age where eight graders (50%) consumed more EDs as compared to sixth grader (18.6%).

Our study showed that athletes living with both parents were less likely to consume EDs (89%). However, some athletes reported that 22% of their parents consumed EDs sometimes. This indicates the influence of parents on their children's attitudes towards EDs consumption. It was shown that parental lack of awareness about caffeine-related health risks on young children and the differences between EDs and other soft drinks was the reason for allowing their children to consume EDs (Oddy & O'Sullivan, 2009).

In contrast to Koivusilta L. et al. (Koivusilta, Kuoppamaki, & Rimpela, 2016), Our study showed that athletes who slept 7 hours and more were more likely to consume EDs than athletes sleeping less than 7 hours. This could be explained that athletes who sleep longer hours felt that they needed to drink EDs in order to feel energized for their sports activity. Nowak D. et al (Nowak & Jasionowski, 2016) showed that 28% of respondents claimed that EDs gave them a boost of energy. Similarly, our study showed that 19% of the athletes consumed the EDs to increase their energy and enhance their performance. Caffeine is the primary source of energy in EDs. It has been shown that caffeine enhances physical performance in adults by improving concentration, reduces fatigue, enhance alertness and power (Paluska, 2003). However, these effects vary according to the consumer age, sex and caffeine dependency (Schneider & Benjamin, 2011). Two randomized studies among elite junior athletes showed that pre-exercise ingestion of EDs had a positive effect on participants sports performance (Abian-Vicen et al., 2014; Gallo-Salazar et al., 2015), however both studies involved small numbers of participants thus this should further be investigated in a bigger sample with concerns to the long-term effects of EDs on physical performance and overall health issues.

It has been showed that some adolescents consume EDs for their perceived physiological benefits without being aware of the potential health risks of these drinks (O'Dea, 2003). Similar to others (Maryam M. Nassaif, 2015; Musaiger & Zagzoog, 2013; Nowak & Jasionowski, 2016; Zucconi, 2013), 54% of EDs consumers in our study reported that the main reason for consuming EDs was its good taste. In contrast with another study, we found that 82% of the athletes didn't know that EDs contained caffeine and 20% believed that EDs contained vitamins (Musaiger & Zagzoog, 2013). The majority of athletes in our study believed that EDs and soft drinks are different (76%), which was in contrast to Musaiger et al. (Musaiger & Zagzoog, 2013) who found that 67% of adolescents considered EDs similar to soft drinks. Hardy. et al (Hardy, Kliemann, Evansen, & Brand, 2017) investigated the association between EDs consumption and overall knowledge score and found that users of EDs scored significantly lower on the section of food/nutrients sources and disease knowledge than did non EDs users. Caffeine content in EDs ranges from 50-505 mg in a can or bottle depending on the capacity. This amount is equal to or even exceeds the amount of caffeine in a cup of coffee (Clauson, Shields, McQueen, & Persad, 2008; Reissig et al., 2009). In addition to EDs consumption, athletes in our study also consumed other caffeinated beverages such as soft drinks (23%), and tea (39%) which can further increase their daily caffeine intake. An excess amount of caffeine can lead to many negative health effects such as sleep disturbance, anxiety, jitteriness, gastrointestinal effects, tachycardia, and other cardiac symptoms and in some rare cases seizures and death (Harris & Munsell, 2015; Reissig et al., 2009; Seifert et al., 2011).

Different countries have set their own regulatory policies regarding labeling, distribution, and sale of EDs with a high content of caffeine. Regulations of the European enforced additional caffeine labeling for EDs with 150 mg/l caffeine (Thomson, 2010). In all EU Member States, EDs can be sold but with specific regulations including setting rules for sales to youths. For example, in Sweden, some products sales are regulated by pharmacies and sales to children under the age of 15 years are illegal (Oddy & O'Sullivan, 2009). In Canada, EDs require warning labels, the maximum daily consumption amount and advise against mixing EDs with alcohol (Temple, 2009). In the UAE, the Emirates Authority for standards and Metrology (ESMA) have set regulation policies for EDs labelling such as not allowing pregnant and lactating women, persons under the age of 16 years, persons with sensitivity to caffeine, and those with heart and arterial problems, as well as athletics during exercises to drink EDs (Metrology, 2015). It is necessary to amend the UAE standards for EDs for those under the age of 18 years by placing restrictions on EDs marketing, limiting EDs sales places, active enforcement of a minimum purchase age with age verification card. Moreover, relevant authorities should be instructed to discourage mixing EDs with other beverages.

## 5. Conclusions

EDs consumption rate was moderate among young male athletes in the UAE. Educational programs are needed to increase awareness regarding EDs consumption and its potential adverse effects. A regulation policy for EDs consumption should be addressed, and consideration of warning labels with EDs contents and age identification is highly recommended.

### 5.1 Strength and Limitation

To our knowledge, this is the first study investigating the EDs consumption prevalence among young athletes. The face-to-face questionnaire interview gave more accurate responses compared to self-reporting data. We used a modified validated questionnaire from the EFSA study to examine practices of EDs with reliable measurements.

We have to acknowledge that this study has certain limitations. Our study is a cross-sectional study, so implications of casual association cannot be accurately made. Additionally, athletes included in this study may not be representative of all sports athletes in the UAE.

### 5.2 Implications

The present study gave unique information regarding the prevalence of EDs consumption among children and adolescents in Al Ain city. The study also investigated the related influence factors of EDs consumption and knowledge towards EDs consumption among athletes.

On October 1, 2017, the UAE Federal Tax Authority has implemented excise tax at a rate of 100% on EDs. It would be very interesting to conduct a follow-up study after tax implementation on EDs to compare it with our findings.

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## Author Contributions

AAA contributed to conception and design, acquisition of data, data analysis and interpretation. Both AAA and HR drafted the paper and critically reviewed the manuscript; NA contributed to study design, data collection and reviewed the manuscript. All authors gave the final approval of the version to be published.

## Competing Interests Statement

The authors declare that there are no competing or potential conflicts of interest.

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