Journal of High Institute of Public Health 2022;52(2):73-81

Original Article

Caffeine Consumption among Young Athletes and Their Perception in Relation to Performance

Doaa T. Mohamed [1¥], Heba A. Abdelaziz [2]

1 Department of Nutrition, High Institute of Public Health, Alexandria University, Egypt

2 Department of Family Health, High Institute of Public Health, Alexandria University, Egypt

Abstract

Background: Caffeine intake is common among adolescents especially young athletes for many reasons. Many young adolescents and athletes had mixed perceptions of caffeine safety.
Aims: The aim of present study was to estimate mean daily caffeine consumption among young athletes, identify different caffeinated products commonly consumed by them, assess their perception towards caffeinated products in relation to athletic performance.
Methods: A cross sectional approach using a predesigned interview questionnaire to collect data from 420 adolescent athletes, aged 13-18 years of both sexes, recruited from different sports was followed.
Results: The mean caffeine intake from all sources (frequently cola drinks) was 47.3 ± 54.2 mg/day (0.9 ± 1.3 mg/kg/day). Total daily caffeine intake was positively correlated with training load ($p<0.001$). More than half (57.8%) of young athletes who took supplements or caffeinated beverages were advised to do so by a coach. Improvement of athletic performance, increase attention, and improvement of body shape were the common reasons for supplements and caffeinated beverages intake. Around 40% of young athletes perceived that intake of caffeinated beverages before training improves energy and attention, respectively during training. While 20.5% agreed that they reduce tension before training or competitions.
Conclusion: The mean caffeine intake from all sources was considered safe. There is a positive relationship between total daily caffeine intake and perception that intake of caffeinated beverages before training improves energy and attention during training, and that they reduce the tension before training. Although, caffeine intake was within safe levels, young athletes should be aware of different sources of it to avoid negative side effects of its high intake.

Keywords: Caffeine, adolescents, athletes, performance, perception

Available on line at:
jhiphalexu.journals.ekb.eg

Print ISSN: 2357-0601
Online ISSN: 2357-061X

¥*Correspondence*:
Email: doaa_tawfik@alexu.edu.eg

Suggested Citations: Mohamed DT, Abdelaziz HA. Caffeine Consumption among Young Athletes and Their Perception in Relation to Performance. JHIPH. 2022;52(2):73-81.

INTRODUCTION

Caffeine is one of the most frequently consumed psychoactive stimulant substances worldwide. It is widely available to adults, adolescents and even young children. [(1)] Naturally, caffeine is found in coffee, tea, and cocoa while synthetic caffeine is added in many products marketed as energy and performance enhancers such as dietary supplements, cola beverages, and energy drinks. [(2)]

Moderate caffeine consumption is considered safe and has been approved by many regulatory agencies around the world (e.g., EFSA, FDA, Health Canada). [(3)] Caffeine enhances performance by improving physical endurance, reduction of fatigue, as well as enhancing mental alertness and concentration. The short-term effects of caffeine include enhanced mood and alertness, improved ability to remain awake, mental alertness after fatigue, accelerated information processing speed, and reaction time, in addition to heightened awareness and attention. It was suggested to improve many cognitive and behavioral processes associated with the improvement of sport, exercise, and cognitive performance (whether alertness, concentration, energy levels, or self-reported feelings of fatigue). [(4)]

Negative and stressful effects of caffeine on mental health have also been observed. Higher anxiety levels were reported in moderate and high caffeine consumers compared with abstainers. In general, the negative effects of caffeine are usually observed in relation to excessive intake. At extremely high doses its consumption can induce a condition known as "caffeinism". Symptoms include anxiety, nervousness, restlessness, insomnia, excitement, psychomotor agitation, dysphoria, and a rambling flow of thoughts and/or speech. [(5, 6)]

Neither the Dietary Guidelines for Americans nor the Institute of Medicine provides guidance for caffeine as a nutrient. However, some adolescent

athletes consume caffeinated drinks encouraged by coaches to enhance academic achievement and athletic performance. [7] Despite the potential benefits, caffeine consumed at very high levels can put them at risk for being overstimulated, accelerated aggression, reduced sleeping hours, and increased daytime sleepiness, therefore negatively impacting training and performance. [8] Caffeine safety in adolescents is continuously being researched and determining safe consumption levels for this population subgroup is difficult. It was noted that regular caffeine consumption up to about 3 mg/kg per day doesn't appear to induce behavioral changes in children and adolescents, but caffeine doses of about 1.4 mg/kg may increase sleep latency and reduce sleep duration in some children and adolescents, particularly when consumed close to bedtime. [8, 9]

Many young adolescents had mixed perceptions of caffeine and caffeinated beverages safety. [10, 11] Due to its potential adverse health effects on young adults, assessment of daily intake of caffeinated products from dietary sources and commonly consumed products among them are topics of continuous research. Therefore, the present study aimed at estimating the mean daily caffeine intake among young athletes, identifying the commonly consumed products, and determining their perception regarding caffeinated products in relation to performance.

The aim of present study was to estimate the mean daily caffeine consumption among young athletes, identify different caffeinated products commonly consumed by them, assess their perception towards caffeinated products in relation to their athletic performance and investigate the association between amount of caffeine intake and perception about caffeinated beverages intake.

METHODS

Study setting

The present study was conducted in one sport club and one sport youth center in Alexandria, Egypt.

Study design

A cross-sectional approach was used to conduct the study.

Target population

The study population was 420 adolescents aged between 13-18 years of both sexes, recruited from different sports in the mentioned settings practicing sports regularly for at least two years.

Sampling design

Sample size: Assuming that caffeine consumption among adolescents is 69% with 3% marginal error and 97% confidence interval the minimal sample size of 403 is required for the study. [9]

Type of sample and method of selection: A convenient sample was selected from one sports club and one sports youth center representing different sociodemographic characteristics and high attendance rates.

Data collection methods

Data were collected from the athletes after taking consent from their parents by a self-administered questionnaire including: Personal and socio-demographic characteristics (age, sex, residence, type of school, pocket money, parent's education, and occupation) and thletic data (type of sport either single such as gymnastics and swimming or team sports for example basketball, football, and volleyball). Also, they were asked about years of practicing, duration of training (hours per day/ week). Participants were asked about commonly consumed dietary supplements and caffeinated beverages, the reasons behind consuming these products and source of advice. Perception about caffeinated products consumption in relation to time of training or competition and probable side effects was assessed. Food frequency questionnaire method (FFQ) was used to estimate the dietary intake and frequency of consumption of beverages and products containing caffeine commonly consumed by the participants. [12] These products were tea (high and low extracted tea, tea with milk, and green tea), coffee (regular coffee, instant coffee black, instant coffee with creamer, instant coffee with creamer and sugar, and decaffeinated instant coffee), cola drinks (regular and diet), cocoa (regular and with milk), chocolates, and energy drinks. Based on values that had been determined in a previous study, the average caffeine content in a certain amount of a product was indicated and daily dietary intake of caffeine (mg/day) consumed by the studied participants was estimated. [13]

Weight (kg) was measured according to the recommended procedures to estimate caffeine intake per kilogram of body weight.[14]

Ethical considerations:

Approval of Ethics Committee of the High Institute of Public Health, Alexandria University was obtained on November 26th, 2019. All parents of the participants were informed, and their verbal consent was taken after explaining the aim of the study. Confidentiality of the collected data of the participants was considered. No private questions were included. No obligation of any kind was used to let participants participate in the study, and any participant was free to withdraw from completing the study at any time. There is no conflict of interest.

Statistical analysis:

The collected data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp), statistically analyzed using the appropriate techniques to achieve the objectives of the study. The Kolmogorov- Smirnov was used to verify the normality of distribution of variables. Comparisons between groups for categorical variables were assessed using Chi-square test (Fisher or Monte Carlo). Mann Whitney test was used to compare between two groups for not normally distributed quantitative variables. Pearson coefficient correlate between two normally distributed quantitative variables. Spearman coefficient was used to correlate between quantitative variables. Significance of the obtained results was judged at the 5% level ($p \leq 0.05$).

RESULTS

Age ranged from 10 to 18 years. Boys represented about two thirds (63.3%) of the studied participants versus 36.7% who were girls. Although, many young athletes in the study were practicing more than one sport, the highest percent were practicing basketball and volleyball (19.5% and 19%, respectively) followed by swimming and martial arts (14.8% and 13.3%, respectively). The mean years of practicing sport was 5.8 ± 2.4 years. The mean number of daily training hours was 2.4 ± 1.2 hours for 3.8 ± 1.8 times per week with a mean training load of 9.9 ± 8.7 hours/ week. Mean body weight of the study participants was 56.6 ± 12 kg (Table 1).

Approaching half (48.1%) of the studied young athletes reported no dietary supplements nor caffeinated beverages intake, which was more represented in girls (52.6%). About one third (30.2%) of the studied sample reported multivitamin minerals intake as dietary supplements followed by omega 3 supplements in 13.1% and protein/ creatine supplements by 10.7% with a statistically significant differences at the favor of boys to girls (p= 0.001 and 0.005, respectively). Only 9.3% reported intake of caffeinated beverages (tea/ coffee and energy drinks by 7.9% and 1.4%, respectively). As regards reasons for intake, improvement of athletic performance, increase attention, and improvement of body shape were the common reasons as reported by the young athletes (62.4%, 35.8%, and 19.2%) of those who consumed such products and that was also higher in boys than girls with statistically significant difference (p=0.019 and 0.013, for improvement of athletic performance and improvement of body shape, respectively). More than half (57.8%) of those consuming supplements or caffeinated beverages were advised by a coach and that was higher in boys than in girls, followed by family in 27% which was on the contrary higher in girls than boys, and the difference was statistically significant in both (p<0.001) (Table 2).

As regards young athletes' perception of caffeinated beverage consumption in relation to training, 40.2% of them agreed that intake of caffeinated beverages before training improves energy and activity during the training. Almost two fifths (39.8%) of the studied sample (with more boys than girls, 44.7% vs. 31.2%, respectively) agreed that caffeinated beverages intake before training helps them to concentrate and improve their attention, with statistically significant difference (p=0.006). About one fifth of them (20.5%) agreed that the mentioned beverages reduce the tension before training or competitions higher among boys than girls (23.7% vs. 14.9%, respectively) and the difference was statistically significant (p=0.032) (Table 3).

Table (1): Distribution of the studied young athletes according to personal characteristics and athletic profile

Personal characteristics and athletic profile	Athletes (n=420) No. (%)
Age (years)	
Median (Min. – Max.)	15 (10 – 18)
Mean ± SD.	15.1 ± 1.8
Sex	
Boys	266 (63.3%)
Girls	154 (36.7%)
Type of sport #	
Swimming	62 (14.8%)
Gymnastics	26 (6.2%)
Martial arts	56 (13.3%)
Tennis	8 (1.9%)
Ping pong	8 (1.9%)
Squash	32 (7.6%)
Running	22 (5.2%)
Football	43 (10.2%)
Handball	38 (9.0%)
Basketball	82 (19.5%)
Volleyball	80 (19.0%)
Water polo	6 (1.4%)
Others	19 (4.5%)
Years of practicing sport	
Median (Min. – Max.)	6 (2 – 14)
Mean ± SD.	5.8 ± 2.4
Duration of training (hours/ day)	
Median (Min. – Max.)	2 (1 – 10.5)
Mean ± SD.	2.4 ± 1.2
Times of training/ week	
Median (Min. – Max.)	3 (2 – 20)
Mean ± SD.	3.8 ± 1.8
Training load (hours/week)	
Median (Min. – Max.)	6.0 (2.0 – 80.0)
Mean ± SD.	9.9 ± 8.7
Usual time to feel fatigue in training (min.)	
Median (Min. – Max.)	60 (20 – 180)
Mean ± SD.	58.3 ± 28.1
Body weight(kg)	
Median (Min. – Max.)	58 (18 – 90)
Mean ± SD.	56.6 ± 12

#More than one answer

Table (2): Distribution of the studied young athletes according to dietary supplements and caffeinated beverages consumption

Dietary supplements and caffeinated beverages consumption	Total (n = 420) No. (%)	Boys (n=266) No. (%)	Girls (n=154) No. (%)	χ^2	p
Dietary supplements and caffeinated beverages (#)					
Multivitamin minerals	127 (30.2%)	73 (27.4%)	54 (35.1%)	χ^2=2.686	0.101
Salt tablets	6 (1.4%)	2 (0.8%)	4 (2.6%)	χ^2=2.359	^{FE}p=0.198
Omega 3/ cod liver oil	55 (13.1%)	46 (17.3%)	9 (5.8%)	χ^2=11.234*	0.001*
Protein/ creatine	45 (10.7%)	37 (13.9%)	8 (5.2%)	χ^2=7.744*	0.005*
Tea/ coffee	33 (7.9%)	23 (8.6%)	10 (6.5%)	χ^2=0.625	0.429
Sports drinks	5 (1.2%)	5 (1.9%)	0 (0%)	χ^2=2.930	^{FE}p=0.163
Energy drinks	6 (1.4%)	2 (0.8%)	4 (2.6%)	χ^2=2.359	^{FE}p=0.198
No intake	202 (48.1%)	121 (45.5%)	81 (52.6%)	χ^2=1.974	0.160
Reasons of intake (#)	**(n=218)**	**(n=145)**	**(n=73)**		
Improve body shape	42 (19.2%)	34 (23.4%)	8 (11%)	χ^2=6.238*	0.013*
Improve sport performance	136 (62.4%)	97 (66.9%)	39 (53.4%)	χ^2=5.529*	0.019*
Increase attention	78 (35.8%)	42 (29%)	36 (49.3%)	χ^2=3.713	0.054
Others	4 (1%)	2 (1.4%)	2 (2.7%)	χ^2=0.309	^{FE}p=0.626
Source of advice for intake (#)	**(n=218)**	**(n=145)**	**(n=73)**		
Family	59 (27%)	25 (17.2%)	34 (46.6%)	χ^2=12.986*	<0.001*
Friends	17 (1.8%)	11 (7.6%)	6 (8.2%)	χ^2=0.014	0.905
Coach	126 (57.8%)	101 (69.7%)	25 (34.2%)	χ^2=21.943*	<0.001*
Physician	22 (10%)	14 (9.7%)	8 (11%)	χ^2=0.001	0.976
Others	2 (0.9%)	0 (0%)	2 (2.7%)	χ^2=3.471	^{FE}p=0.134

#:More than one answer χ^2: Chi square test FE: Fisher Exact
p: p value for comparing between the studied categories
*: Statistically significant at $p \leq 0.05$

Table (3): Distribution of the studied young athletes according to perception about caffeinated beverages intake

Perception	Total (n = 420) No. (%)	Boys (n=266) No. (%)	Girls (n=154) No. (%)	χ^2	p
Caffeinated beverage intake before training improves energy during training (agree)	169 (40.2%)	116 (43.6%)	53 (34.4%)	χ^2=3.428	0.064
Caffeinated beverage intake before training improves attention during training (agree)	167 (39.8%)	119 (44.7%)	48 (31.2%)	χ^2=7.496*	0.006*
Caffeinated beverage intake before training decreases tension before training (agree)	86 (20.5%)	63 (23.7%)	23 (14.9%)	χ^2=4.585*	0.032*

χ^2: Chi square test p: p value for comparing between the studied categories *: Statistically significant at $p \leq 0.05$

Concerning the caffeinated beverage intake experience, almost three quarters (73.3%) of the participants reported that these beverages caused sleep disturbance or difficulty falling asleep if they were taken shortly (1-2 hours) before sleep and that was higher among girls than boys, with statistically significant difference (p=0.011). Regarding time passing before feeling fatigue in training, if preceded by intake of caffeinated beverages, nearly half (48.7%) of those who reported caffeinated beverages consumption did not perceive any difference, followed by 29.2% who thought they felt fatigue earlier, while 22.1% thought that they felt fatigue after longer time compared to "no intake".

Most of those who reported caffeinated beverages consumption (70.4%) did not notice any side effects after intake of an amount higher than usual of these beverages. However, 10.9% of them could not complete the training normally, 7.9% felt headache, and 6.4% reported tremors. These were higher among boys than girls with statistically significant difference (p=0.006) (Table 4)

Table (4): Distribution of the young athletes according to their experience of caffeinated beverage intake

	Total (n = 420) No. (%)	Boys (n=266) No. (%)	Girls (n=154) No. (%)	Test of sig.	p
Caffeinated beverage intake before sleep (1-2 hours) makes it difficult to fall asleep	308 (73.3%)	184 (69.2%)	124 (80.5%)	χ^2=6.421*	0.011*
Time to feel fatigue in training if proceeded by intake of caffeinated beverages	**(n=267)**	**(n=188)**	**(n=79)**		
Same as no intake	130 (48.7%)	86 (45.7%)	44 (55.7%)		
Less than no intake	78 (29.2%)	55 (29.3%)	23 (29.1%)	χ^2= 19.004*	<0.001*
More than no intake	59 (22.1%)	47 (25.0%)	12 (15.2%)		
Side effects after caffeinated beverage intake in amount higher than usual(#)	**(n=267)**	**(n=188)**	**(n=79)**		
No side effects	188 (70.4%)	129 (68.6%)	59 (74.7%)		
Tension	7 (2.6%)	5 (2.7%)	2 (2.5%)		
Headache	21 (7.9%)	15 (8%)	6 (7.6%)	χ^2= 17.374*	MCp= 0.006*
Anxiety	5 (1.9%)	5 (2.7%)	0 (0%)		
Tremors	17 (6.4%)	13 (7%)	4 (5%)		
Unable to continue training	29 (10.9%)	21 (11.2%)	8 (10%)		

χ^2: Chi square testMC: Monte Carlo U: Mann Whitney test
p: p value for comparing between the studied categories *: Statistically significant at $p \leq 0.05$

Most of the young athletes (98.6%) consumed caffeine with a mean intake of 47.3±54.2 mg/day (0.9±1.3 mg/kg /day) and that was higher among boys than girls with statistically significant difference (p<0.001 and p=0.004, respectively) (Table 5).

Table (5): Caffeine intake of the young athletes

	Total (n=420)	Boys (n=266)	Girls (n=154)	U	p
Total caffeine mg/ day					
Median (Min. – Max.)	32.5 (0 – 423.4)	37 (0 – 274.7)	21.6 (0 – 423.4)	15924.0*	<0.001*
Mean ± SD.	47.3 ± 54.2	49.7 ± 48.6	43.2 ± 62.6		
Intake mg/ weight kg/ day					
Median (Min. – Max.)	0.5 (0 – 14.1)	0.6 (0 – 5.5)	0.4 (0 – 14.1)	17065.0*	0.004*
Mean ± SD.	0.9 ± 1.3	0.9 ± 0.9	1 ± 1.8		

Cola beverages were the most frequently consumed caffeinated product among the young athletes. They were consumed by 28.1% of the participants several times daily (with mean frequency of intake 4.77 times weekly), followed by low extracted tea, then chocolate. Cocoa and energy drinks were the least consumed caffeinated products (by only 1% and 0.2% of participants daily) (Figure 1).

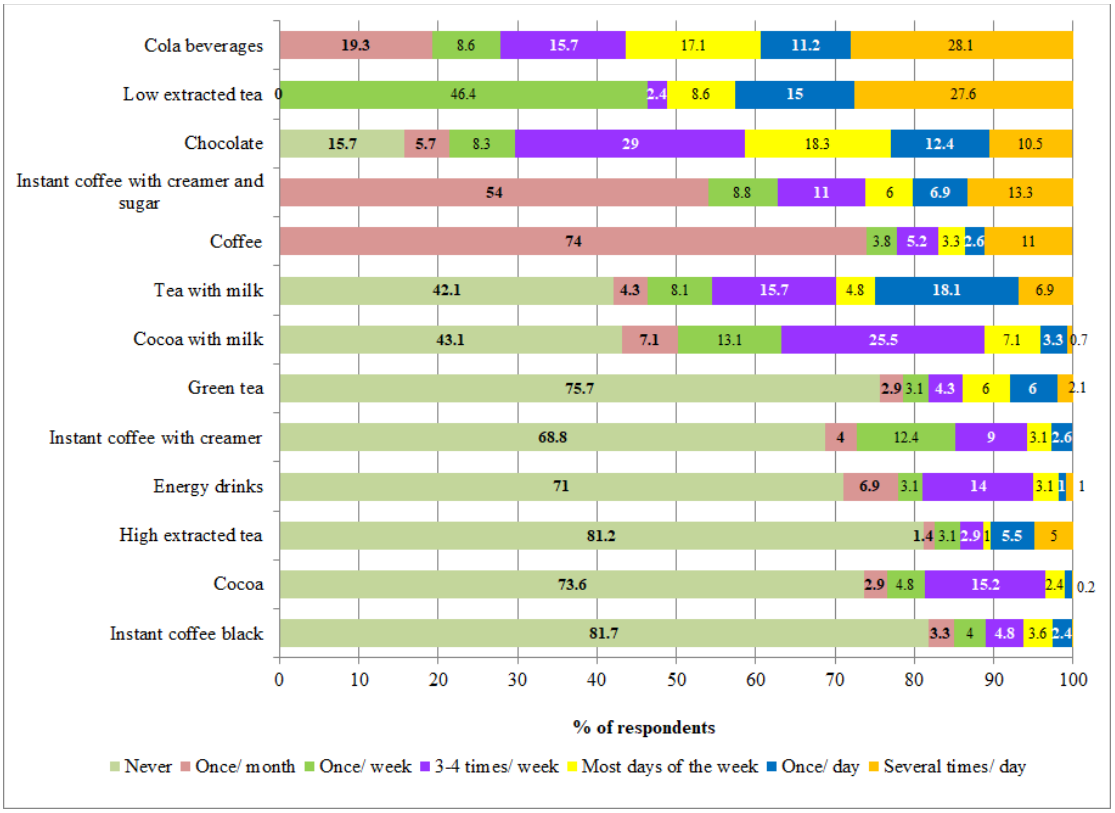

Figure (1): Frequency intake/ week of different caffeinated products by the studied athletes

Total daily caffeine intake was positively correlated with training load (hours/week) (r=0.236, p<0.001) while caffeine intake/kg body weight /day was negatively correlated with time passing before feeling tired during training if immediately preceded by intake of caffeinated beverages (r=-0.195, p<0.001). There was a positive relationship between total daily caffeine intake by the young athletes and their perception that caffeinated beverages intake before training improves energy and activity during the training (r_s=0.308, p<0.001), caffeinated beverages helped them to concentrate and improved their attention (r_s=0.369, p<0.001), and that they reduced the tension before training or competitions (r_s=0.287, p<0.001) (Table 6).

Table (6): Relation between total caffeine intake/ day and intake/ kg weight/ day with training load and perception about caffeinated beverages intake

	Total caffeine intake /day		Intake/ weight/day	
Duration of training session (hours/ day)	r = 0.256*	<0.001*	r = 0.111*	0.023*
Times of training/ week	r = 0.143*	0.003*	r = 0.078	0.111
Training load (hours/ week)	r = 0.236*	<0.001*	r = 0.106*	0.030*
Time to feel tired	r = 0.070	0.155	r = -0.195*	<0.001*
Perception questions				
Caffeinated beverage intake before training improves energy during training	**r_s**= 0.308*	<0.001*	**r_s**= 0.296*	<0.001*
Caffeinated beverage intake before training improves attention during training	**r_s**= 0.369*	<0.001*	**r_s**= 0.351*	<0.001*
Caffeinated beverage intake before training decreases tension before training	**r_s**= 0.287*	<0.001*	**r_s**= 0.287*	<0.001*

r: Pearson coefficient r_s: Spearman coefficient *: Statistically significant at $p \leq 0.05$

DISCUSSION

Caffeine intake is common among different age groups for its stimulant properties, and it varies across different types of beverages such as tea, coffee, cola beverages, and energy drinks.[3] Despite that caffeinated beverage intake was reported by only 9.3% (tea/coffee and energy drinks) of the present study participants, most of them were consuming caffeinated products most frequently cola drinks without proper analyzing for their intake. This means that young athletes are lacking the knowledge about cola ingredients specifically caffeine content in agreement with previous studies; knowledge about whether cola beverages contain caffeine was low. [3, 15] Mean caffeine intake from all sources among the present study participants was 47.3 ± 54.2 mg/day (0.9 ± 1.3 mg/kg/day) and that was considered safe compared to that set by EFSA. [9] On the contrary, this was far lower than that reported by many previous studies. [1, 3, 16-21] This might be due the differences in age categories of the previous studies, reasons of intake, tools, and methods of assessment of daily intake, or differences in caffeine content of different products across different regions.

Unlike adults whose major sources of caffeine are usually coffee and tea, followed by carbonated soft drinks, the preference of young people is for cola drinks, followed by tea and coffee. [3, 9] That agreed with the findings of the present study where the most frequently consumed caffeinated product among the young athletes was cola beverages followed by tea and chocolate.

Caffeine has been found to be ergogenic for cognitive performance in most people, including attention and vigilance. Caffeine-containing pre-workout supplements have been shown to improve anaerobic and aerobic performance. [4] Interestingly, in the current study, an unignorable percentage of the athletes agreed that intake of caffeinated drinks before training gives them more energy and activity during the training, helps them to concentrate more and reduces their stress before training or tournaments with moderate positive correlation between caffeine intake and perception regards those effects. These agreed with many previous studies that found non consistent youth and young adults' perceptions towards caffeinated drinks in relation to physical performance. [10, 11, 22] Moreover, while some adolescent athletes might not believe that caffeine is required for success in their sport, they could still believe that it is important for specific training adaptations, such as strength and power. [23]

It was believed that caffeine was able to prolong the time to exhaustion improving the overall endurance. [24] On the contrary, it was shown in the present study that near half of the young athletes reported that they felt tired within the same duration as with no intake and small number of them reported that intake of caffeinated drinks before exercise decreased the duration before exhaustion, which may be explained by that high caffeine doses may be linked to decreased performance in some athletes. After consumption, the responses in people vary, with a range of positive, neutral, or negative effects on performance depending on the person's genotype, training status, habitual use of caffeine, gender, caffeine source, and age. [24]

Despite that caffeine can enhance awareness, attention, and reaction time by stimulating wakefulness, concentration, and diminishing the sense of tiredness, caffeine consumption is associated with an increase in reported sleep difficulties, difficulty falling asleep, sleep disturbances, and insomnia in adolescents. [25, 26] High intake of caffeine might cause dizziness, headache, tremors, anxiety, sleeplessness, and gastrointestinal discomfort. [27] About three quarters of the young athletes in the present study reported that caffeinated drinks caused them sleep disturbance if they were taken shortly before sleep (that was higher among girls than boys). Among those who reported caffeinated beverages consumption, 70.4% did not notice any side effects after intake amount higher than usual of these beverages and that was higher among girls than boys while boys reported different side effects such as inability to complete the training normally, headache, and tremors. Several studies compared the effects of caffeine among males and females, reporting similar effects in both sexes, [4, 28, 29] however, the present study found differences between males and females regarding this aspect contradicting others. These could be due to different caffeine metabolism rates linked to circulating steroid hormones particularly during pubertal development, which could modify response to caffeine. [30]

In addition to caffeine as a performance enhancer, vitamin/mineral supplements, sports/protein powders, and creatine are popular supplements used by adolescent athletes. Use of 'performance-enhancing' nutritional supplements is common among young athletes for a variety of reasons, including maintaining/or gaining a healthy and attractive physical appearance, as well as improving athletic performance, peer, societal, and marketing pressure, in addition to the need to accomplish results. [31, 32] Similarly, the present study found that more than half of the participants use dietary supplements mainly multivitamins/minerals followed by omega 3 supplements and protein/ creatine supplements with improvement of athletic performance was the common reason for supplement intake among the studied young athletes. Coaches have a critical role in helping young athletes improve their physical, mental, and ethical standards. Coaches and athletic trainers were

identified as key sources of nutrition advice. [32, 33] Similarly, the present study found that more than half of the participants were advised by coaches, therefore this highlights the importance of regularly implementing coach education programs.

CONCLUSION AND RECOMMENDATIONS

Mean caffeine intake from all sources among the present study participants was considered safe with cola drinks being the most frequently consumed. Total daily caffeine intake was positively correlated with training load (hours/ week) while caffeine intake/ kg body weight/ day was negatively correlated with time passing before fatigue perception during training if immediately preceded by intake of caffeinated beverages. There was a positive relationship between total daily caffeine intake by the young athletes and their perception that caffeinated beverages intake before training improves energy and activity during the training, caffeinated beverages help them to concentrate and improve their attention, and they reduce the tension before training or competitions. Awareness about caffeine content of different products may help young athletes to improve their performance without exposure to negative effects.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

FUNDING

The research was self-funded by the authors.

REFERENCES

1. Błaszczyk-Bębenek E, Jagielski P, Schlegel-Zawadzka M. Caffeine consumption in a group of adolescents from South East Poland—A cross sectional study. Nutrients. 2021;13(6):2084.
2. Bojarowicz H, Przygoda M. Caffeine. Part I. Common use of caffeine and its effect on human organism. Probl Hig Epidemiol. 2012;93:8–13.
3. Verster JC, Koenig J. Caffeine intake and its sources: A review of national representative studies. Crit Rev Food Sci Nutr. 2018 58(8):1250-9.
4. Guest NS, VanDusseldorp TA, Nelson MT, Grgic J, Schoenfeld BJ, Jenkins DM, et al. International society of sports nutrition position stand: caffeine and exercise performance. J Int Soc Sports Nutr. 2021;18(1):1.
5. Aljarboa AM, Al Ghassab MA, Almuzaini NK, Alshammari AN, Dhanarasu S, Qiblawi S. Effects of caffeinated beverages with BMI and academic stress. Egypt Acad J Biolog Sci. 2018;10(1):127-38.
6. Paz-Graniel I, Kose J, Babio N, Hercberg S, Galan P, Touvier M, et al. Caffeine intake and its sex-specific association with general anxiety: A cross-sectional analysis among general population adults. Nutrients. 2022;14:1242.
7. Branum AM, Rossen LM, Schoendorf KC. Trends in caffeine intake among US children and adolescents. Pediatrics. 2014;133(3):386–93.
8. Kang SH, Yoo HN, Chung SH, Kim CY. Eveningness, sleep patterns, daytime sleepiness and fatigue in Korean male adolescents. Sleep Med Psychophysiol. 2012;19:89-96.
9. Agostoni C, Canani RB, Fairweather-Tait S, Heinonen M, Korhonen H, La Vieille S, et al. Scientific opinion on the safety of caffeine. EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA). EFSA J. 2015;13(5):4102-20.
10. Bunting H, Baggett A, Grigor J. Adolescent and young adult perceptions of caffeinated energy drinks. A qualitative approach. Appetite. 2013;65:132-8.
11. Brittany C, Jessica R, David H. At-a-glance - perceptions of caffeinated drinks among youth and young adults in Canada. Health Promot Chronic Dis Prev Can. 2018;38(5):214–8.
12. Bartok C, Mahan K. Intake: Assessment of food and nutrition-related history. In: Raymond JI, Morrow K, editors. Krause and Mahan's Food & The Nutrition Care Process. 15th ed. Missouri: Elsevier Saunders; 2017. p. 84-102.
13. Tayel DI, Abo-Rhyem SM, Tawfik D. Caffeine content of products in Egyptian markets and its daily intake among Alexandria University employees. Int J Food Sci Nutr. 2018;3(6):14-21.
14. Gibson RS. Principles of Nutritional Assessment. 2nd ed. Oxford: Oxford University Press; 2005.
15. Thakre TP, Deoras K, Griffin C, Vemana A, Podmore P, Krishna J. Caffeine awareness in children: Insights from a pilot study. J Clin Sleep Med 2015;11(7):741–6.
16. El-Nimr NA, Bassiouny SH, Tayel DI. Pattern of caffeine consumption among university students. JHIPH. 2019;49(3):154-61.
17. Riera-Sampol A, Rodas L, Martínez S, Moir HJ, Tauler P. Caffeine intake among undergraduate students: sex differences, sources, motivations, and associations with smoking status and self-reported sleep quality. Nutrients. 2022;16(8):1661.
18. Wierzbicka E, Brzozowska A, Mróz A. Assessment of dietary caffeine intake among school-age adolescents. Probl Hig Epidemiol. 2017;98:407–10.
19. Kharaba Z, Sammani N, Ashour S, Ghemrawi R, Al Meslamani AZ, Al-Azayzih A, et al. Caffeine consumption among various university students in the UAE, exploring the frequencies, different sources and reporting adverse effects and withdrawal symptoms. J Nutr Metab. 2022;2022.
20. Jahrami H, Al-Mutarid M, Penson PE, Faris MA, Saif Z, Hammad L. Intake of caffeine and its association with physical and mental health status among university students in Bahrain. Foods. 2020;9(4).
21. Khalil M, Antoun J. Knowledge and consumption of caffeinated products by university students in Beirut, Lebanon. Clin Nutr ESPEN. 2020;37:213–7.
22. Costa BM, Hayley A, Miller P. Young adolescents' perceptions, patterns, and contexts of energy drink use. Appetite. 2014;80:183–9.
23. loodworth A, Petroczi A, Bailey R, Pearce G, McNamee M. Doping and supplementation: the attitudes of talented young athletes. Scand J Med Sci Sports. 2012;22:293–301.
24. Samoggia A, Rezzaghi T. The consumption of caffeine-containing products to enhance sports performance: An application of an extended model of the theory of planned behavior. Nutrients. 2021;13:344.
25. Aepli A, Kurth S, Tesler N, Jenni OG, Huber R. Caffeine consuming children and adolescents show altered sleep behavior and deep sleep. Brain Sci. 2015;5(4):441–55.
26. Jin M, Yoon C, Ko H, Kim H, Kim A, Moon H, et al. The relationship of caffeine intake with depression, anxiety, stress, and sleep in korean adolescents. Korean J Fam Med. 2016;37:111-6.
27. Doepker C, Franke K, Myers E, Goldberger JJ, Lieberman HR, O'Brien C, et al. Key findings and implications of a

recent systematic review of the potential adverse effects of caffeine consumption in healthy adults, pregnant women, adolescents, and children. Nutrients. 2018;10(10):1536.
28. Suvi S, Timpmann S, Tamm M, Aedma M, Kreegipuu K, Ööpik V. Effects of cafeine on endurance capacity and psychological state in young females and males exercising in the heat. Appl Physiol Nutr Metab. 2017;42(1):68–76.
29. Skinner TL, Desbrow B, Arapova J, Schaumberg MA, Osborne J, Grant GD, et al. Women experience the same ergogenic response to caffeine as men. Med Sci Sports Exerc. 2019;51(6):1195-202.
30. Temple JL, Ziegler AM. Gender differences in subjective and physiological responses to caffeine and the role of steroid hormones. J Caffeine Res. 2011 1(1):41–8.
31. Parnell JA, Wiens KP, Erdman KA. Dietary intakes and supplement use in pre-adolescent and adolescent Canadian athletes. Nutrients. 2016;8(9):526.
32. Tawfik S, El Koofy N, Moawad MEM. Patterns of nutrition and dietary supplements use in young Egyptian athletes: A community-based cross-sectional survey. PLoS One. 2016;11(8):e0161252.
33. Torres-McGehee TM, Pritchett KL, Zippel D, Minton DM, Cellamare A, Sibilia M. Sports nutrition knowledge among collegiate athletes, coaches, athletic trainers, and strength and conditioning specialists. J Athl Train. 2012;47(2):205–11.