

Case Series

Prevalence of performance-enhancing drug use among gym members in Saudi Arabia, Riyadh: A cross-sectional survey

Rawan Eskandarani^{1*}, Abdulaziz Alhamad² and Saad Almodameg²

¹Emergency Medicine, Consultant, King Fahad Medical City, Riyadh, Saudi Arabia

²Emergency Medicine, Resident, King Fahad Medical City, Riyadh, Saudi Arabia

Abstract

Context: Illicit and performance-enhancing drug (PED) use is prevalent among athletes.

Aims: We examine the prevalence of PED use among amateur athletes, identify the common characteristics and associated risk factors for illicit PED use and measure the perception and awareness among gym members regarding the safety and effects of illicit drug use.

Settings and design: This cross-sectional study was conducted among adult male and female gym center attendees in Riyadh, Saudi Arabia.

Methods and materials: Self-administered Arabic and English questionnaires were used for data collection.

Statistical analysis used: SPSS version 26 was used to perform t- and chi-square tests.

Results: This study included 379 participants, of whom 59.6% were male, 52.8% were between 26 and 35 years of age, and a majority of the participants had normal (47.5%) or overweight (40.9%) body mass index. Our study revealed a high prevalence (48.5%) of PED use among gym athletes in Riyadh, Saudi Arabia. Moreover, the true prevalence might have been higher due to the possibility of underreporting by some participants because of the sensitivity of the subject. Protein powder was the most commonly used type of PED. Of all the participants, 22.3% reported anabolic androgenic steroid use. Side effects of PEDs were observed in 19% of the study participants.

Conclusion: The results of this study should encourage public health researchers and health advocates to design and implement behavioral interventions to educate the public on the benefits, risks, and contraindications of dietary supplements used by athletes to enhance their body performance.

Key messages

- Performance-enhancing drug (PED) use is prevalent among both professional and amateur athletes.
- Gym athletes in Riyadh, Saudi Arabia, report increasing PED use.
- Side effects and negative health impacts are associated with illicit PED use.
- Misinformation on the risks and benefits of PEDs is a major public health concern.
- More efforts should be implemented in public awareness about the risk of using PED targeting younger populations.

Introduction

Performance-enhancing drugs (PEDs) are a category of substances used to improve activity performance. This has been used to obtain an extra benefit over non-users in certain circumstances. Physical performance-enhancing illicit drug use has been associated with the athletic community and the history of sports [1,2]. The negative impact of PEDs on health and the ethical implications thereof have been frequently

discussed in the professional athletic world, and its popularity among adolescents emphasizes the importance of studying its safety even among regular users [3].

Study objectives

In the present study, we aimed 1) to examine the prevalence of illicit and PED use among amateur athletes, 2) to identify the common characteristics and associated risk

More Information

*Address for Correspondence:

Dr. Rawan Eskandarani, Emergency Medicine Administration, King Fahad Medical City, Prince Abdulaziz Ibn Musaid Ibn Jalawi St, St. Riyadh 12231, Saudi Arabia,
Email: reskandarani@kfmc.med.sa

Submitted: February 17, 2022

Approved: December 26, 2022

Published: December 27, 2022

How to cite this article: Eskandarani R, Alhamad A, Almodameg S. Prevalence of performance-enhancing drug use among gym members in Saudi Arabia, Riyadh: A cross-sectional survey. *J Sports Med Ther.* 2022; 7: 039-043.

DOI: 10.29328/journal.jsmt.1001062

Copyright License: © 2022 Eskandarani R, et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Keywords: Dietary supplements; Body performance; Performance-enhancing drugs; Athletes; Exercise; Supplements





factors for illicit PED use, and 3) to measure the perception and awareness among gym members regarding the safety and effects of illicit drug use.

Hypotheses

- Null hypothesis: Amateur athletes are aware of the safety and effects of drug use.
- Alternative hypothesis: Amateur athletes are not aware of the safety and effects of drug use.

Significance

The study findings are highly valuable, as few studies in the region have examined illicit, non-prescription PED use in general. The results can help to estimate the awareness of athletes about this type of supplementation, and in the future, we will be able to target those who are at higher risk. Recognizing the associated risk factors and demographic variables can help guide future educational and awareness targeting.

Subjects and methods

Ethical considerations

Ethical approval was obtained from the IRB in the institution. The participants were informed about the purpose of the research, and we obtained verbal and written consent prior to administering the questionnaire. Ethical considerations were also taken to ensure confidentiality and to protect the privacy of the collected data.

Study design: Cross-sectional survey.

Study population & setting: The participants were selected from men and women who attended a gym center in Riyadh, Saudi Arabia. The exclusion criteria were as follows:

- Age < 18 years,
- Individuals not living in Riyadh, Saudi Arabia and
- Individuals taking a prescribed anabolic steroid or supplement because of medical illness.

Sample size

The estimated sample size was based on the prevalence of using a performance-enhancing agent of 70%, a confidence interval of 95% and a precision of 5%. Using an online calculator (www.calculator.net), the estimated sample size was 323 participants. To compensate for the non-response rate or exclusion, the sample size was increased to 350.

Data collection

The self-administered Arabic and English questionnaires consist of three sections that aim to understand the circumstances or the environment that influence a higher

use of PEDs. The first section concerns the demographics of the participants, and the second and third sections are aimed at understanding the participants' training and nutritional habits.

A multistage sampling technique was used to select the sample as follows: Riyadh is divided into five administrative regions (north, south, middle, east, and east). A list of gyms in each region was collected and numbered randomly by the random number generator, and then gym members were asked to complete the survey.

Statistical analysis

Data were analyzed using SPSS version 26 (IBM Corp., Chicago, IL, USA). The t-test was used to analyze continuous variables, and the chi-square test was used to analyze categorical variables. p - values < 0.05 were considered statistically significant.

Results

Table 1 shows the socio-demographic and training-related characteristics of the participants. Overall, 48.5% of the participants used PEDs, 59.6% were male and 52.8% were between 26 and 35 years of age. Most participants had a normal (47.5%) or overweight (40.9%) body mass index (BMI). More than half of the respondents (58.0%) had a bachelor's degree, and 55.1% were married. Overall, 40.1% had a monthly income between 5000 and 10000 SAR and 39.3% had an income higher than 10,000 SAR. Three respondents had hypothyroidism. Among the participants, 20.3% had been training in the gym for more than 3 years, and 44.1% usually trained at night, mostly 3 (39.1%) or 4 (33.2%) times per week. Most participants (62.5%) trained for up to 1 hour on average. The main purpose of the training was weight loss in 47.8% of participants, professional competition in 45.9%, and bodybuilding in 36.1%. More than half of the respondents (58.3%) had no nutritional monitoring.

Table 2 shows PED-related perception and awareness among the gym participants using PEDs. Regarding the types of PED used, 77.7% used protein powders, 47.3% used vitamins, 42.4% used caffeine, 25.5% used an amino acid supplement, 14.7% used creatine and only 3.3% used thyroxine. Anabolic steroids were used by 22.3% of the participants, with 7.6% not currently using them (**Supplementary Material**). Overall, 54.3% obtained their PEDs from the pharmacy without prescriptions, and 21.2% obtained their PEDs from friends. Weekly, most of the participants used PEDs 2 times or less (50%) or 3 – 4 times (40.8%). Among the participants, 64.7% started using PEDs between 21 and 30 years of age, and 19% had side effects from PED use. In our survey, 65.8% of the respondents believed that informing their physicians about their use of PEDs may change their treatment plan, and only 35.3% informed their physicians about their PED use.



Table 1: Socio-demographic and training-related characteristics of the participants (N = 379).

Variable	Frequency (N = 379)	Percent (%)
Sex		
• Male	226	59.6
• Female	153	40.4
Age group		
• ≤ 25 years	94	24.8
• 26–35 years	200	52.8
• ≥ 36 years	85	22.4
BMI* group		
• Underweight	5	1.3
• Normal	180	47.5
• Overweight	155	40.9
• Obese	39	10.3
Educational level		
• High school or lower	115	30.3
• Bachelor's degree	220	58.0
• Master's degree or higher	44	11.6
Marital status		
• Single	149	39.3
• Married	209	55.1
• Divorced	21	5.5
Monthly income		
• < 5000 SAR	78	20.6
• 5000–10 000 SAR	152	40.1
• > 10 000 SAR	149	39.3
Type of housing		
• Apartment	147	38.8
• House	232	61.2
Residence		
• North of Riyadh	97	25.6
• South of Riyadh	55	14.5
• West of Riyadh	58	15.3
• East of Riyadh	58	15.3
• Central Riyadh	111	29.3
Any endocrinal disease		
• Hypothyroidism	3	0.8
• None	376	99.2
Period of training in the gym		
• < 6 months	66	17.4
• 6 months to 1 year	96	25.3
• 1–3 years	140	36.9
• >3 years	77	20.3
Time usually trained in the gym		
• Morning	41	10.8
• Afternoon	37	9.8
• Evening	134	35.4
• Night	167	44.1
Days of training per week		
• ≤ 2	34	9.0
• 3	148	39.1
• 4	126	33.2
• ≥ 5	71	18.7
Hours of training per session		
• Up to 1 h on average	237	62.5
• 1–3 h on average	139	36.7
• 3–5 h on average	3	0.8
The main purpose of training		
• Weight loss	181	47.8
• Bodybuilding	137	36.1
• Professional competition	174	45.9
Nutritional monitoring		
• No	221	58.3
• Certified nutritionist	63	16.6
• Fitness coach	95	25.1
Use of PEDs†		
• Yes	184	48.5
• No	195	51.5

*BMI: Body Mass Index; †PED: Performance-Enhancing Drugs

Table 2: PED-related perception and awareness among the gym participants using PEDs.

Variable	Frequency (N = 184)	Percent (%)
Type of PED* used		
• Protein powders	143	77.7
• Amino acid	47	25.5
• AAS†	41	22.3
• Vitamins	87	47.3
• Creatine	27	14.7
• Caffeine	78	42.4
• Thyroxine	6	3.3
Source of PEDs*		
• Pharmacy, with prescriptions	8	4.3
• Pharmacy, without prescriptions	100	54.3
• Friends	39	21.2
• Online shopping	37	20.1
No. of PEDs* used per week		
• ≤ 2	92	50.0
• 3 or 4	75	40.8
• ≥ 5	17	9.2
Age when started using PEDs*		
• ≤ 20 years	28	15.2
• 21–30 years	119	64.7
• ≥ 30 years	37	20.1
• Not sure	20	10.9
Experienced side effects		
• Yes	35	19.0
• No	149	81.0
Use of AASs†		
• Used it in the past	14	7.6
• Currently using it	27	14.7
• Intend to use it in the future	13	7.1
• Never used it	110	59.8
The belief that informing their physician about their use of PEDs* may change their treatment plan		
• Yes	121	65.8
• No	63	34.2
Inform their physician about their PED* use when consulting for any reason		
• Yes	65	35.3
• No	119	64.7
Source of information about PEDs*		
• Personal trainer	86	46.7
• Friends	39	21.2
• Physician	12	6.5
• Social media	41	22.3
• Web search	60	32.6
• Nutritionist	20	10.9

*PED: Performance-Enhancing Drugs; †AAS: Anabolic Androgenic Steroids.

Table 3 illustrates the side effects and participants' responses to them. The most reported side effect was acne (37.1%), followed by palpitations (31.4%), lower gastrointestinal (GIT) disturbances (14.3%), headache (11.4%), and increased libido (8.6%). Overall, 31.4% of participants stopped using PEDs because of the side effects; 34.3% of participants sought medical care, and 54.3% achieved complete resolution from side effects after stopping PED use.

Table 4 presents the relationships of PED use with sociodemographic characteristics, the period of training, and nutritional monitoring. The results showed significant relationships between PED use with sex, age group, BMI group, social status, period of training in the gym, and nutritional monitoring. The relationships between PED use the monthly income and educational level were not statistically significant.

**Table 3:** Side effects and response to them among the participants with side effects.

Variable	Frequency (N = 35)	Percent (%)
Side effect		
• Headaches	4	11.4
• Nausea/Vomiting	3	8.6
• Acne	13	37.1
• Increased libido	3	8.6
• Palpitations	11	31.4
• Lower GIT* disturbance	5	14.3
Stopped PED [†] use after experiencing side effects		
• Yes	11	31.4
• No	24	68.6
Sought medical care for the side effect		
• Yes	12	34.3
• No	23	65.7
Side effects resolved after stopping PED [†] use (reversible)		
• Yes	19	54.3
• No	3	8.6
• Some	13	37.1

*GIT: Gastrointestinal; [†]PED: Performance-Enhancing Drug.

Discussion

The PEDs are pharmacologic agents used by athletes and nonathlete weightlifters to enhance performance. Common PEDs include anabolic androgenic steroids (AASs), human growth hormone, creatine, erythropoietin, blood doping, amphetamines and stimulants, and beta-hydroxy-beta-methyl butyrate. Reported rates of PES use among athletes are variable, ranging from 5% to 31% [4]. Our study showed that the prevalence of PED use among athletes attending the gym was 48.5%, among which 77.7% used protein powders, 47.3% used vitamins, 42.4% used caffeine, 25.5% used amino acid supplements, 14.7% used creatine, only 3.3% used thyroxine (**Supplementary Material**). These results are comparable to those found in another cross-sectional study conducted in Riyadh, Saudi Arabia; by Al Ruthia, et al. [5], found the prevalence of using PEDs to be 44.5%, among which the commonly consumed supplements were protein (61.6%), multivitamins (45.5%), amino acids (38.9%), and omega-3 fatty acids (32.8%). Another cross-sectional study conducted in Saudi Arabia by Al, et al. [6], showed a prevalence of 70%, among which 68.4% used protein powder supplements and 48.1% used energy drinks (caffeine).

Despite these reports, the worldwide prevalence of PED use among gym athletes is estimated to be between 5% and 31% [4]. High rates have been consistently documented in Scandinavia, Brazil and British Commonwealth countries, and more recently in continental Europe. In contrast, their use is rare in East Asian countries, such as China, Korea, and Japan, perhaps because these cultures give less importance to male muscularity, as explained in a recent report [7].

In our study, although friends were the source of 21.2% of PEDs, which may be unlicensed products that contain unknown ingredients or are contaminated with microorganisms [8], most of the PEDs in the aforementioned studies are legal. Regarding prohibited substances annually listed by WADA,

Table 4: Relationship of PED use with sociodemographic characteristics, the period of training, and nutritional monitoring.

		Use of PEDs [†]			p-value
		Yes (N = 184)	No (N = 195)	Total (N = 379)	
Sex	Male	122 66.3%	104 53.3%	226 59.6%	0.007
	Female	62 33.7%	91 46.7%	153 40.4%	
Age group	≤ 25 years	49 26.6%	45 23.1%	94 24.8%	0.001
	26–35 years	113 61.4%	87 44.6%	200 52.8%	
	≥ 36 years	22 12.0%	63 32.3%	85 22.4%	
BMI* group	Underweight	2 1.1%	3 1.5%	5 1.3%	0.01
	Normal	86 46.7%	94 48.2%	180 47.5%	
	Overweight	86 46.7%	69 35.4%	155 40.9%	
	Obese	10 5.4%	29 14.9%	39 10.3%	
Social status	Single	56 30.4%	93 47.7%	149 39.3%	0.001
	Married	120 65.2%	89 45.6%	209 55.1%	
	Divorced	8 4.3%	13 6.7%	21 5.5%	
Monthly income	< 5000 SAR	36 19.6%	42 21.5%	78 20.6%	0.881
	5000–10 000 SAR	74 40.2%	78 40.0%	152 40.1%	
	> 10 000 SAR	74 40.2%	75 38.5%	149 39.3%	
Educational level	High school or lower	61 33.2%	54 27.7%	115 30.3%	0.506
	Bachelor's degree	103 56.0%	117 60.0%	220 58.0%	
	Master's degree or higher	20 10.9%	24 12.3%	44 11.6%	
Period of training in the gym	< 6 months	21 11.4%	45 23.1%	66 17.4%	0.0001
	6 months to 1 year	35 19.0%	61 31.3%	96 25.3%	
	1–3 years	82 44.6%	58 29.7%	140 36.9%	
	> 3 years	46 25.0%	31 15.9%	77 20.3%	
Nutritional monitoring	Yes (certified nutritionist or fitness coach)	105 57.1%	53 27.2%	158 41.7%	0.0001
	No	79 42.9%	142 72.8%	221 58.3%	

*BMI: Body Mass Index; [†]PED: Performance-Enhancing Drug

Al Ghobain [9] performed an analytical investigation of 4,482 urine samples from Saudi Arabian athletes from 2008 to 2016. The prevalence of positive samples for prohibited substances in athletes in Saudi Arabia was 3.1%. Anabolic steroids and stimulants were the most prevalent prohibited substances.

Specifically, anabolic steroids were used in 22.3% of our study population. Al Bishi & Afify [10] conducted a cross-sectional study on 400 male gymnasts in the Western province



of Riyadh, Saudi Arabia, and showed that the frequency of AAS users was 24.50%, which is compatible with our results.

The side effects of PED use were observed in 19.1% of our participants. Our results also showed that 31.4% of PED users stopped using PEDs because of the side effects. Similarly, Alshammari, et al. [11], stated that 16.8% of supplement users noticed side effects, and 25.7% of them stopped using supplements because of the side effects.

The source of information for most PED users is unreliable and usually includes personal trainers (46.7%), web search (32.6%) and/or friends (21.2%). Only 17.4% of participants reported a physician or nutritionist as one of their sources. This explains why only 4.3% received their PEDs from pharmacies with prescriptions (see Supplementary Material).

Our study showed a significant relationship between PED use with sex, age group, BMI group, social status, period of training in the gym, and nutritional monitoring. Another study analyzing the participants' characteristics against supplement use showed a statistically significant association between supplement use and smoking, BMI, total duration of gym attendance, frequency of exercise, and having a special diet ($p < 0.001$) [11]. However, our findings showed an insignificant relationship between PED uses and the monthly income or educational level, in contrast to Al Bishi & Afify's study [10], which compared sociodemographic characteristics of AAS users with those of non-users. They reported statistically significant relationships between AAS to use the age group, nationality, level of education, marital status, and monthly income.

Our study revealed a high prevalence of PED use (48.5%) among gym athletes in Riyadh, Saudi Arabia. Moreover, the true prevalence might have been higher due to the possibility of underreporting by some participants because of the sensitivity of the subject. Protein powder was the most commonly used type of PED. Among all the participants, 22.3% reported AAS use. Side effects of PEDs were observed in 19% of the study participants. The results of this study should encourage public health researchers and health advocates to design and implement behavioral interventions through media campaigns and other means to educate the public on the benefits, risks, and contraindications of dietary supplements used by athletes to enhance their body performance.

(Questionnaire and Supplementary material)

References

1. Reardon CL, Creado S. Drug abuse in athletes. *Subst Abuse Rehabil.* 2014 Aug 14;5:95-105. doi: 10.2147/SAR.S53784. PMID: 25187752; PMCID: PMC4140700.
2. Baron DA, Martin DM, Abol Magd S. Doping in sports and its spread to at-risk populations: an international review. *World Psychiatry.* 2007 Jun;6(2):118-23. PMID: 18235871; PMCID: PMC2219897.
3. World Anti-Doping Agency. ADAMS. 2021. https://www.wada-ama.org/en/what-we-do/adams?gclid=CjwKCAjwssD0BRBIEiwA-JP5rMV6CzRwywYPTZ07S79rK2yYznT5VwLcZ0RkTtTWIbwnS2a2CKushoC7GcQAvD_BwE
4. Momaya A, Fawal M, Estes R. Performance-enhancing substances in sports: a review of the literature. *Sports Med.* 2015 Apr;45(4):517-31. doi: 10.1007/s40279-015-0308-9. PMID: 25663250.
5. AlRuthia Y, Balkhi B, Alrasheed M, Altuwaijri A, Alarifi M, Alzahrani H, Mansy W. Use of dietary and performance-enhancing supplements among male fitness center members in Riyadh: A cross-sectional study. *PLoS One.* 2018 Jun 21;13(6):e0199289. doi: 10.1371/journal.pone.0199289. PMID: 29928034; PMCID: PMC6013215.
6. Al OM, Elshatarat RA. Influence of knowledge and beliefs on consumption of performance enhancing agents in north-western Saudi Arabia. *Ann Saudi Med.* 2017 Jul-Aug;37(4):317-325. doi: 10.5144/0256-4947.2017.317. PMID: 28761032; PMCID: PMC6150593.
7. Pope HG Jr, Wood RI, Rogol A, Nyberg F, Bowers L, Bhasin S. Adverse health consequences of performance-enhancing drugs: an Endocrine Society scientific statement. *Endocr Rev.* 2014 Jun;35(3):341-75. doi: 10.1210/er.2013-1058. Epub 2013 Dec 17. PMID: 24423981; PMCID: PMC4026349.
8. Owens DJ, Tang JC, Bradley WJ, Sparks AS, Fraser WD, Morton JP, Close GL. Efficacy of High-Dose Vitamin D Supplements for Elite Athletes. *Med Sci Sports Exerc.* 2017 Feb;49(2):349-356. doi: 10.1249/MSS.0000000000001105. PMID: 27741217.
9. Al Ghobain M. The use of performance-enhancing substances (doping) by athletes in Saudi Arabia. *J Family Community Med.* 2017 Sep-Dec;24(3):151-155. doi: 10.4103/jfcm.JFCM_122_16. PMID: 28932159; PMCID: PMC5596627.
10. Al Bishi KA, Afify A. Prevalence and awareness of Anabolic Androgenic Steroids (AAS) among gymnasts in the western province of Riyadh, Saudi Arabia. *Electron Physician.* 2017 Dec 25;9(12):6050-6057. doi: 10.19082/6050. PMID: 29560159; PMCID: PMC5843433.
11. Alshammari SA, AlShowair MA, AlRuhaim A. Use of hormones and nutritional supplements among gyms' attendees in Riyadh. *J Family Community Med.* 2017 Jan-Apr;24(1):6-12. doi: 10.4103/2230-8229.197175. PMID: 28163569; PMCID: PMC5248439.