A Ten-year Assessment of Anabolic Steroid Misuse among Competitive Athletes in Puerto Rico

P Acevedo[1], JC Jorge[1], A Cruz-Sánchez[2], E Amy[3], JL Barreto-Estrada[1]

ABSTRACT

Objective: *Little is known about anabolic androgenic steroids (AAS) misuse in the Caribbean region in spite of increased popularity among athletes and adolescents. The present study examines the usage of AAS among competitive athletes in Puerto Rico.*

Methods: *Doping test results of competitive athletes obtained by random sampling out of competition during the 2000–2009 period were analysed. Doping tests were executed by the Centre for Sports, Health and Exercise Sciences (Albergue Olímpico, Salinas, Puerto Rico). A total of 550 athletes were monitored during 2000–2009. Information was collected with regard to competitive sport, gender and AAS compounds whenever a positive test result was encountered.*

Results: *From the total sample of monitored cases during the past decade, 5.4% showed adverse analytical findings. Anabolic androgenic steroids misuse was detected among male (62%) and female (38%) athletes. Weightlifting showed the greatest percentage of positive AAS doping test results (70% of total cases) and stanozolol was the most commonly misused exogenous androgen (60% of abused AAS whether alone or as part of a cocktail). Testosterone was the most common endogenous misused steroid (10% of misused compounds).*

Conclusion: *In Puerto Rico, AAS misuse was detected across competitive sports for both genders. Although AAS misuse among Puerto Rican athletes shares some features that are consistent with the international sports community, it is imperative to address AAS misuse in the Caribbean region.*

Keywords: Caribbean region, doping, Puerto Rico, steroid misuse

Valoración por Diez Años del Abuso de Esteroides Anabólicos entre los Atletas de Competencia de Puerto Rico

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RESUMEN

Objetivo: *Poco se sabe acerca del abuso de los esteroides anabólicos androgénicos (EAA) en la región del Caribe, a pesar de su creciente popularidad entre atletas y adolescentes. El estudio presente examina el uso de EAA entre los atletas de competencia en Puerto Rico.*

Métodos: *Se analizaron los resultados de la prueba de dopaje practicada a atletas de competencia mediante un muestreo aleatorio realizado a partir de competencias celebradas durante el 2000-2009. Las pruebas de dopaje fueron realizadas por el Centro de Deportes, Salud y Ciencias del Ejercicio (Albergue Olímpico, Salinas, Puerto Rico). Se monitorearon un total de 550 atletas durante 2000–2009. Se recogió información en relación con los deportes de competencia, género, y compuestos de EAA, siempre que la prueba arrojara resultados positivos.*

Resultados: *De la muestra total de casos supervisados durante la década pasada, 5.4% mostraron resultados analíticos adversos. Se detectó un uso inapropiado de esteroides anabólicos androgénicos entre los atletas varones (62%) y hembras (38%). El levantamiento de pesas mostró el porcentaje más*

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alto de resultados de dopaje positivos a EAA (70% del total de casos) y el estanozolol fue el andrógeno exógeno más comúnmente mal empleado (60% de los EAA usados inapropiadamente, bien solos o como parte de un cóctel). La testosterona fue el esteroide endógeno más comúnmente abusado (10% de los compuestos mal empleados).

Conclusión: *En Puerto Rico, se detectó uso inapropiado de EAA en los deportes de competencia de ambos géneros. Aunque el abuso de EAA entre los atletas portorriqueños comparte algunas de las características correspondientes a la comunidad internacional de deportes, es absolutamente necesario profundizar en el problema del abuso de los EAA en el área del Caribe.*

Palabras claves: Región del Caribe, dopaje, Puerto Rico, abuso de esteroides

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INTRODUCTION

Anabolic androgenic steroids (AAS) are scheduled III controlled substances, following Drug Enforcement Administration classification, that are misused by adult recreational and competitive athletes. These synthetic derivatives of testosterone are also misused by a growing number of adolescents to alter physical appearance and to increase muscular mass and strength in spite of their lack of knowledge about the detrimental effects of these compounds on health. Anabolic androgenic steroids side effects range from acne, hirsutism, clitoral enlargement and deepened voice in women, and baldness in men to hypertension, heart hypertrophy, kidney failure, prostatic hypertrophy and liver dysfunction, among other life-threatening conditions (1−4). Concerning behavioural changes, AAS can trigger affective disorders that can lead to aggressive and violent episodes (5−8).

In the United States of America (USA), the National Institute on Drug Abuse (NIDA) recently published that 12th-grader males consistently reported higher rates of AAS use than females (9). In fact, the geographical distribution of studies concerning AAS misuse is mostly precluded to the USA, Canada, Brazil and some European countries. In the Caribbean, there is a scarcity of reports with regard to AAS misuse (10−11). The aim of this study is to determine the profile of AAS use among adult competitive athletes in Puerto Rico between the years 2000−2009. In Puerto Rico, AAS use is illegal following the Control Act of 1990 of the USA and athletes are required to follow International Olympic Committee (IOC) regulations. In this study, and for the first time in the Caribbean region, we examined doping test results according to competitive sports, AAS and gender.

SUBJECTS AND METHODS

We obtained doping test results from the Centre of Sports Health and Exercise Sciences (SADCE), Albergue Olímpico, Salinas, Puerto Rico from 2000−2009. Urine samples (specific gravity ≥ 1.010, pH = 5−7) collected with Berег-Kits were processed by Insitut Armand Frappier Laboratories (Montreal, Canada) as certified by the World Anti-Doping Agency (WADA). Two urine samples per athlete were collected (n = 550 athletes) out of competition. We classified test results according to year, competitive sport and gender of the athlete. We registered individual cases by using a coding system to avoid personal identifiers. Although these doping tests monitored a wide range of controlled substances following the WADA regulations, attention was paid to AAS exposure when detected by itself or as part of a cocktail of controlled substances. Adverse analytical findings for endogenous androgens were also registered. This study excludes doping test results of non-Puerto Rican athletes who were monitored during international competitive athletic events that occurred in the Island. Although the exact number of cases for a given variable is specified in the text, data are depicted as percentages in relation to the total number of cases for a given variable. This study received approval by the Institutional Review Board at the University of Puerto Rico, Medical Sciences Campus.

RESULTS

The Olympic Committee of Puerto Rico has in place a monitoring system on AAS misuse among competitive athletes following IOC regulations. The total number of athletes tested for AAS misuse during the 2000–2009 period was 550. Overall, 5.4% of monitored cases during the past decade showed adverse analytical findings. Except for 2001, most values for adverse analytical findings on AAS were below 10% of the total cases that were monitored on a given year (Fig. 1). Anabolic androgenic steroids misuse was detected among male (62%) and female (38%) athletes, although in years 2000, 2008 and 2009 only males were positive for anabolic steroids (Fig. 2). Weightlifting was the sport that showed the greater percentage of AAS adverse analytical findings (70% of cases), followed by track and field (13.5% of cases) and basketball (13.5% of cases, Fig. 3). It is worthy of note that all the adverse findings in 2001 were related to weightlifting. Some sports that were monitored but did not show adverse findings included: baseball, swimming and fencing. The Table shows that stanozolol was the exogenous androgen most commonly misused by competitive athletes (60% of abused AAS whether alone or as part of a cocktail). However, the endogenous androgen, testosterone, was

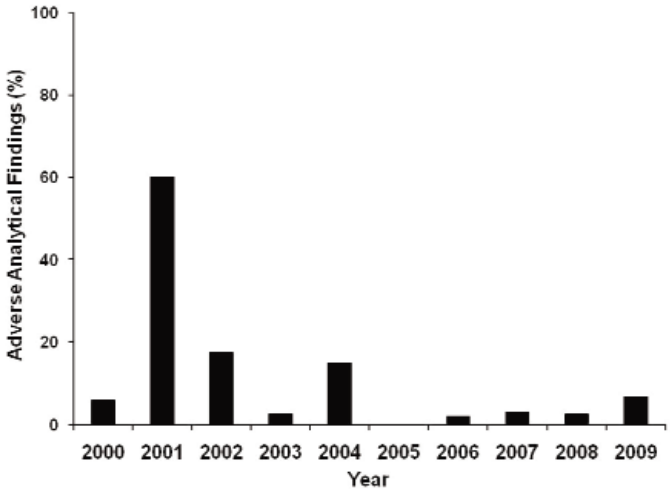

Fig. 1: Adverse analytical findings for AAS misuse among competitive athletes over a decade.
There was a large range in the per cent of competitive athletes who showed adverse analytical findings for AAS exposure from 2000 to 2009 (2000: n = 1/17; 2001: 6/10; 2002: 8/46; 2003: 2/77; 2004: 3/20; 2005: 0/68; 2006: 3/146; 2007: 2/66; 2008: 1/40; 2009: 4/60). During this time period, 550 athletes were tested.

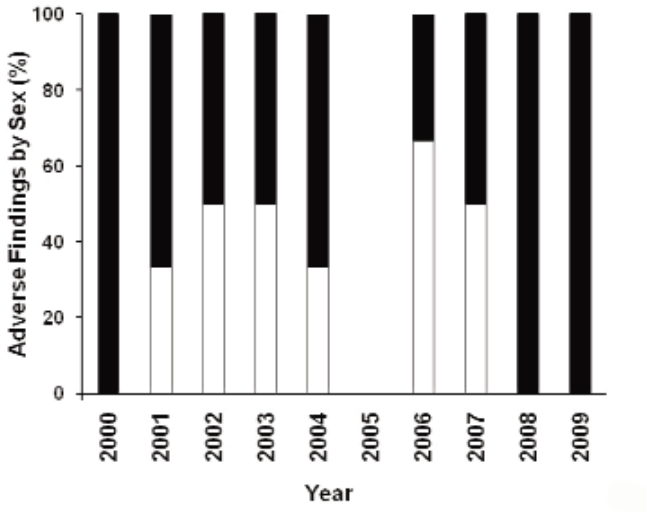

Fig. 2: Adverse analytical findings for AAS according to gender. Both males (n = 18) and females (n = 11) showed adverse analytical findings during this time period. One of the records did not specify the gender of the athlete for 2006.
n = male; □ = female.

detected in 10% of the cases. Cocktails comprising three AAS compounds or a combination of AAS plus diuretics were also detected (Table). Two different cocktails that were detected included: (a) stanozolol, boldenone, methandenione and (b) testosterone, methandenione and furosemide.

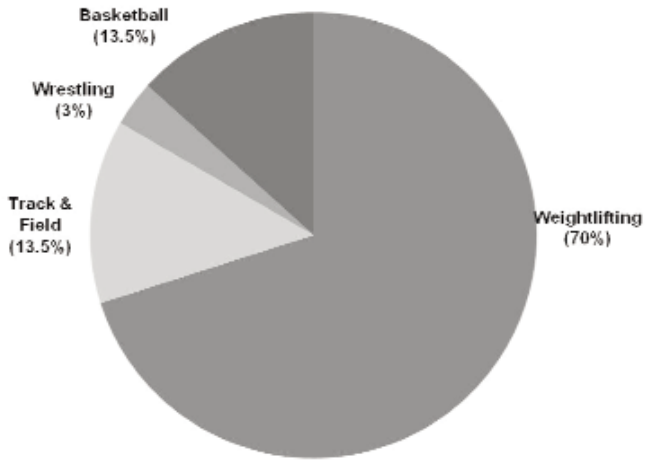

Fig. 3: Adverse analytical findings for AAS misuse according to sport. Athletes using anabolic steroids competed in the following sports: weightlifting (n = 21/30), track and field (n = 4/30), basketball (n = 4/30) and wrestling (n = 1/30). Per cent of athletes according to competitive sports is shown (n = 30 athletes).

Table: Preferred AAS misused by Puerto Rican athletes

Misused AAS	% of cases
Stanazolol	50
Methenolone	13.3
Testosterone	10
Methenolone and Stanazolol	6.7
Nandrolone	6.7
Cocktail*	6.7
Methandenione	3.3
Stanazolol and Boldenone	3.3

*Cocktail comprises three AAS or AAS plus diuretics

DISCUSSION

This study determined the profile of AAS misuse among competitive athletes in Puerto Rico for the first time. Specifically, adverse analytical findings for AAS exposure among competitive athletes over the past decade were reported. The monitoring of steroid misuse should be a priority in athletic training programmes since WADA reported that 59% of controlled substances identified in 2008 were AAS.

The study of AAS misuse in the Caribbean region is scarce. For instance, one survey that included a single item on AAS misuse was administered to young promising athletes to assess youth risk behaviour among students attending a specialized sports school in Puerto Rico (12). The results of the survey detected that 2.5% of students had used AAS without medical prescription. Students in the study reported symptoms of depression (21.5%) and suicidal ideas (12.7%) that were followed by suicidal attempts (2.5%). These results are alarming, since, over the last 20 years, it has become increasingly clear that AAS misuse can

elicit affective disorders (6, 7, 13, 14), syndrome of dependence and hedonia (15−19). Another study in the Caribbean reported AAS usage by gym members in Trinidad. Using self-administered questionnaires, it was found that 2.9% of the respondents used AAS (10). This per cent compares with results for the period 2006−2008 in the present study, which ranged from 2.0−3.0%. However, it is important to highlight that Maharaj and colleagues (10) assessed AAS misuse over a short time period (6 months in 1997) while the present study contains data over a decade.

The present study found AAS misuse among male and female athletes. The Trinidad study showed a higher prevalence of AAS use among males than in females (10). It is of interest for future studies to determine if this gender difference relates to the level of athletic competitiveness (amateur *versus* professional athletes).

In Latin America, Brazil has consistently monitored AAS exposure through the use of surveys and interviews of young adults, students and training apprentices (20−24). Although different scenarios are evident in each of these reports, the prevalence for AAS misuse ranged from 0.1% to 11.1%. Testosterone, nandrolone, and stanozolol are the AAS of choice in Brazil. Indeed, testosterone and stanozolol were detected as the most commonly misused endogenous and exogenous androgens; which is also consistent with the WADA reports. The World Anti-Doping Agency 2008 reports that Cuba and Colombia present adverse analytical findings of 2% and 1.81% of monitored cases, respectively. These results are consistent with the present study's findings for Puerto Rican competitive athletes in 2008. How-ever, the range of adverse findings in this study population is quite broad when looking at the past decade. The fact that weightlifting and track and field were among the sports with high percentages of AAS misuse supports the argument by Alaranta and colleagues (25) that there is a higher risk of doping in speed and power sports.

Taken together, data from the present study show the need for well thought-out monitoring systems for the illegal use of steroid compounds during athletic training and competition. In addition, the data provide a useful framework to establish prevention and educational programmes on AAS misuse in the Caribbean region.

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