



Original Article

## The prevalence of doping among Saudi athletes: Results from the National Anti-Doping Program

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### المخلص

**أهداف البحث:** يعتبر سوء استخدام المواد المحظورة من قبل سلطات (تعاطي المنشطات) مشكلة كبيرة في الرياضة، وقد هزت وسائل الإعلام بنشرها لعدد من حالات تعاطي المنشطات الحديثة السلطات والجمهور العام. وقد أدين عدد كبير من الرياضيين بتعاطي المنشطات. على الرغم من وجود قناعة لدى الرياضيين أن استخدام المنشطات يخالف روح الرياضة ويدركون عواقبها، إلا أنهم ما زالوا يستخدمونها. يُعتقد أن استهلاك المواد المحظورة بين الرياضيين في المملكة العربية السعودية أمرًا شائعًا. هدفت هذه الدراسة إلى دراسة استخدام المنشطات بين الرياضيين السعوديين.

**طرق البحث:** تم عمل مسح منهجي لأخذ عينات عشوائية لكل الرياضيين السعوديين الذين تتراوح أعمارهم بين ١٥ و٤٥ عامًا، المرتبطين بالاتحادات الرياضية السعودية والهيئة العامة للرياضة. خلال الفترة من ٢٠٠٩ إلى ٢٠١٨م، وقد شارك ٣٨٨ من ضباط مكافحة المنشطات في البرنامج الوطني لمكافحة المنشطات، بمجموع ٤٦٠ زيارة منشأة و ١٧١ زيارة مدينة لجمع البيانات.

**النتائج:** تم اختبار ما مجموعه ٦٣٠٦ عينة خلال فترة الدراسة. وكانت العينات السلبية ٦١٦٥ عينة، والعينات الإيجابية ١٤١ (٢.٢٤٪) لتعاطي المنشطات. كان عدد العينات الإيجابية أعلى بشكل ملحوظ بالنسبة للرياضيين المنافسين مقارنة بالرياضيين غير المنافسين. وأظهرت الدراسة أن تعاطي المنشطات يمثل مشكلة كبيرة في السعودية حيث بلغت نسبة انتشاره ٢.٢٤٪ خلال فترة الدراسة، أثبتت

لدى الرياضيين السعوديين نتائج إيجابية لتعاطي المنشطات في جميع الألعاب الرياضية.

**الاستنتاجات:** يعتبر تعاطي المنشطات مشكلة كبيرة في المملكة العربية السعودية. يحتاج البرنامج الوطني لمكافحة المنشطات إلى زيادة الأنشطة التعليمية للوصول إلى جميع الرياضيين في البلاد من أجل ضمان اللعب الآمن والعدل لجميع الرياضيين السعوديين.

**الكلمات المفتاحية:** المواد المحظورة؛ المنشطات؛ تعاطي المخدرات؛ البرنامج الوطني لمكافحة المنشطات؛ الرياضيون السعوديون

### Abstract

**Objectives:** The abuse of substances banned by anti-doping authorities is a significant problem in sports. Recently, several doping cases have been reported by the media. Additionally, a large number of athletes have been found guilty of using banned substances. Although athletes believe that doping is against the spirit of sports and are aware of its consequences, they continue to use these substances. The consumption of banned substances among Saudi athletes is rising. This study aimed to investigate the abuse of drugs among Saudi athletes.

**Methods:** A systematic random sampling cross-sectional survey was administered to all 15-45-year-old Saudi male athletes who were registered with Saudi Sports Federations and the General Sports Authority. From 2009 to 2018, 388 doping control officers participated in the National Anti-Doping Program across 460 facilities. The study necessitated 171 city visits for data collection.

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**Results:** A total of 6306 samples were tested during the study period. There were 6165 negative and 141 (2.24%) positive samples for doping. We report a doping prevalence of 2.24% among Saudi athletes. During the study period, Saudi athletes from all types of sports were tested positive for doping. The number of positive samples was significantly higher among competing athletes than non-competing athletes.

**Conclusion:** Doping is a significant problem in KSA. For safe and fair play by all Saudi athletes, the National Anti-Doping Program should enhance the educational campaigns for all athletes in the country.

**Keywords:** Banned substances; Doping; Drug abuse; National anti-doping program; Saudi athletes

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## Introduction

Abuse of substances banned under doping is considered to be a widespread concern worldwide among athletes in and out of competition. Several top athletes have used banned substances for enhancing performance for many years, especially during competitions. The abuse of these drugs can cause adverse health effects, including anti-social behaviour, dependency and in some cases, death.<sup>1–3</sup> Numerous athletes died as a result of drug abuse. An example that many remember is a professional British cyclist, whose post-mortem analysis revealed that he had ingested a lethal combination of alcohol and amphetamines.<sup>1</sup> Some athletes are aware, to varying degrees, of the risks associated with doping; however, others need more education.<sup>4</sup>

The World Anti-Doping Agency (WADA) was set up in 1999 to administer, screen and curb doping worldwide. WADA updates a banned list of prohibited substances each year and documents the use of the banned substances both inside and outside competitions. At present, a substance must meet two of the following three criteria to be added to the banned list: (1) the substance enhances or is likely to improve performance; (2) the substance denotes a real or possible health threat to the athlete; and (3) the substance violates the sports' spirit.<sup>5</sup>

The Saudi Arabian Anti-Doping Committee (SAADC) was founded in 2004 to work as an independent national committee for the country. The SAADC participates in planning, regulating, executing, checking, and supporting developments related to the monitoring and reporting of doping in KSA.<sup>6</sup> There is currently a scarcity of information in Mediterranean countries including KSA with regard to the prevalence of doping, athletes' attitudes, how much knowledge athletes have about the consumption of banned substances, the kinds of substances most frequently consumed, reasons for consumption, athletes at risk, and specific sports connected with consumption. Consequently,

there is an urgent demand to carry out studies in KSA to address the gap in research literature on doping and to present recommendations to tackle the concerns about doping. The main aim of the current study is to evaluate the prevalence of doping among athletes in KSA.

## Materials and Methods

A systematic random sampling cross-sectional survey was performed on a sample of 15-45-year-old Saudi male athletes frequenting stadiums, sports fields and playgrounds that were linked to Saudi Sports Federations and the General Sports Authority. The questionnaire survey was distributed among 6306 Saudi athletes participating in any of the 25 various sports among 90 different sports-clubs, sports fields, stadiums and playgrounds in 20 different Saudi cities from 2009-2018. From each particular type of sport, we chose athletes via a random sample selection technique in which players from each sport represented the proportion of players in that sport to the total number of registered athletes in all sports.

After a review of the literature, the authors wrote a detailed report on the National Anti-Doping Program. The study questionnaire was constructed by the authors and examined and agreed upon by experts from the members of SAADC. It was piloted to confirm clarity, and the necessary changes were made following the pilot study. Participants fulfilling the inclusion criteria were considered for the questionnaire survey. After explaining the purpose of the study, the participants' consent for participation in the study and the publication of results was obtained. Names were kept anonymous, and confidentiality of data was assured. Participants were told that they could withdraw from the study at any time. Data were used only for the purposes of the study.

Continuous variables for means and standard deviations were outlined and reported. Categorical variables concerning frequency distribution were summarized and reported. As the outcome of interest was opposing 'Ever used any type of prohibited substances', simple binary logistic regressions were made for the interrelationship among athletics, tasks, sports, cities, playgrounds, Doping Control (DC) teams, samples, negative results, positive results, other violations and consciousness of consequences about the consumption of banned substances. For this purpose, unadjusted bivariate analyses for all exposures were independently conducted in order to find an existing correlation with the use of banned substances. Categorical variables were studied using Chi-square tests. Links between exposures and outcomes were considered statistically significant for P below or equal to 0.05. The Statistical Package for the Social Sciences (SPSS) version 22 was used for the analysis; a system program was used to compute the data for this study.

## Results

Statistical data provided by the National Anti-Doping Program during the period 2009–2018 is shown in [Table 1](#), which outlines the testing programs implemented over the past ten seasons. The national study included Saudi athletes from 15–45 years of age. There were 6165 negative

**Table 1: Ten- Season Detection Program.**

Testing 2009–2018	Total samples	Negative results (%)	Positive results (%)
2009–2010	351	331 (94.3)	20 (5.7)
2010–2011	461	447 (97)	14 (3)
2011–2012	430	416 (96.7)	14 (3.3)
2012–2013	507	480 (94.7)	27 (5.3)
2013–2014	616	603 (97.9)	13 (2.1)
2014–2015	810	794 (98)	16 (2)
2015–2016	1127	1110 (98.5)	17 (1.5)
2016–2017	1066	1060 (99.4)	6 (0.6)
2017–2018	938	924 (98.5)	14 (1.5)
<b>Total</b>	<b>6306</b>	<b>6165 (97.76)</b>	<b>141 (2.24)</b>

samples and 141 (2.24%) positive samples. The positive samples percentage for in-competition athletes was significantly higher than that for out-of-competition athletes

(Table 2). During the period 2009–2018, doping was identified in all types of sports among Saudi players.

Table 2 contains the results taken from the Saudi Sports Federations and General Sports Authority in KSA (Ministry of Sports). It shows the total number of tasks during the period 2009–2018 of 1200 with in-competition of 5007, out-of-competition of 1289, Adverse Analytical Finding (AAF) of 141, and Other Violation registered of 12, in the Saudi Sports Federations and General Sports Authority (Ministry of Sports).

The Saudi Anti-Doping Program included a total of 186 target sports visits, 1194 missions, 460 facilities visits, and 171 city visits from 2009 to 2018. Throughout the 10-year period, there were 388 doping control officers. Out of a total of 70 therapeutic use exemption applications, 41 applicants were approved while 29 were rejected. The hearing was 94, and the resolution was 97. Table 3.

**Table 2: Summary of the Saudi Anti-Doping Inspection Program 2009–2018.**

Description/ Year	09–10	10–11	11–12	12–13	13–14	14–15	15–16	16–17	17–18	Sum
Tasks	92	94	79	98	123	159	159	205	191	1200
In-Competition	319	387	370	442	402	608	893	765	821	5007
Out-of-Competition	33	74	60	65	214	202	234	290	117	1289
Adverse Analytical Finding (AAF)	20	14	14	27	13	16	17	6	14	141
Other Violation	1	2	0	3	6	0	0	0	0	12
Percentage %	5.40%	3.03%	3.25%	5.32%	2.11%	1.97%	1.50%	0.56%	1.49%	–

**Table 3: Summary of Work Committees in the Saudi Anti-Doping Program (2009–2018).**

Description/ Year	09–10	10–11	11–12	12–13	13–14	14–15	15–16	16–17	17–18	Sum
Sports Targeted	24	23	23	23	22	20	17	15	19	186
Missions	86	94	79	98	123	159	159	205	191	1194
Facilities visits	40	48	45	41	60	60	58	60	48	460
City visits	12	16	12	15	24	24	23	24	21	171
Doping Control Officers (DCOs)	25	26	23	40	30	56	51	70	67	388
Therapeutic Use Exemption (TUE) Applications	8	16	10	8	N/A	N/A	15	N/A	13	70
Approved	5	8	7	5	N/A	N/A	9	N/A	7	41
Rejected	3	8	3	3	N/A	N/A	6	N/A	6	29
Hearing	20	19	N/A	30	N/A	N/A	13	N/A	12	94
Resolutions	20	16	N/A	30	N/A	N/A	17	N/A	14	97

**Table 4: Summary of the Saudi Anti-Doping Program for Awareness and Development (2009–2018).**

Description/ Year	09–10	10–11	11–12	12–13	13–14	14–15	15–16	16–17	17–18	Sum
Publications	88400	41400	N/A	60000	N/A	35000	148600	15000	60750	449150
Training Courses	1	0	N/A	3	N/A	1	1	0	0	6
Beneficiaries of Training courses	18	0	N/A	112	N/A	56	47	0	0	233
Lectures	0	24	33	10	N/A	32	10	30	31	170
Beneficiaries of Lectures	0	190	N/A	1111	N/A	1854	5571	3082	1221	13029
Sports Targeted	0	N/A	19	N/A	N/A	N/A	15	N/A	15	49
Exhibitions	5	4	3	3	N/A	6	10	7	6	44
Beneficiaries of Exhibitions	N/A	N/A	N/A	N/A	N/A	N/A	5161	N/A	1510	6671
Workshops	1	2	0	3	N/A	0	1	N/A	2	9
Beneficiaries of Workshops	30	30	0	68	N/A	0	48	N/A	125	301

From 2009 to 2018, the Awareness and Development Division of the Saudi Anti-Doping Program produced 449,150 publications (brochures and booklets). There was a total of 6 training courses for 233 participants. There were 170 lectures attended by 13,029 attendees, 49 target sports, 4 exhibitions with 6671 attendees, and 9 workshops with 301 participants. There was a total of 5 conferences with 21,776 attendees. [Table 4](#).

## Discussion

The current study is the second of two that have addressed the doping problem in KSA.<sup>7</sup> Our study provided an overview of the athlete doping testing program over the last ten years including lifespan prevalence and attitudes of Saudi athletes towards abuse of substances banned under doping. Similar data were not previously reported, creating a gap in data addressing doping violations. The only study examining doping violations was a pilot study conducted in Riyadh, KSA, which investigated the consumption of dietary supplements but not banned substances in 105 soccer players. It showed that 93.3% of players used various nutritional supplements during the season with 43% of players reporting supplements consumption for performance enhancement, and 32% of players citing health related benefits as a cause for consuming these supplements.<sup>8</sup> The data used in this statistical study were offered by the National Anti-Doping Program during the study period 2009–2018. The number of negative samples was 6165. On the other hand, there were 141 positive samples. Our study indicated that the lifetime prevalence in KSA of the abuse of substances banned under doping among athletes was 2.24%. Prevalence, knowledge, and attitudes towards banned substance abuse among athletes have been studied in various countries. For example, one Italian study showed that 10% of sports players admitted to the frequent use of anabolic steroids or amphetamines, 7% were reported to be blood doping, and 2% said that they consumed beta-blockers or other banned drugs.<sup>9</sup>

Our results showed that the total tasks from 2009 to 2018 was 1200, followed by in-competition at 5,007, and out-of-competition at 1289. Furthermore, a study conducted in France by Laure P. reported that the prevalence of banned substance abuse in sports-participating children and adolescents was 3–5%.<sup>10</sup> In this study the prevalence amongst boys and sports competitions participants was significantly higher. The banned substance abuse prevalence in adults was shown to be more, with 5–15% of adults consuming banned drugs. The most common substances consumed were narcotics, stimulants, and anabolic steroids.<sup>10</sup>

The Saudi Anti-Doping Program from 2009 to 2018 included a total of 186 target sports visits, 1194 missions, 460 facilities visits, and 171 city visits. Over the 10-year period, the Saudi Anti-Doping Program had 388 doping control officers. There was a total of 70 therapeutic use exemption applications of which 41 applicants were approved while 29 were rejected. The hearing was 94, and the resolution was 97. In Mottram's study, 82.8% of the athletes used supplements, and 28%

admitted that they took vitamins.<sup>11,12</sup> The anti-doping analyses done in 2000–2009 on 100,000 urine samples in Italy indicated that the frequency of positive findings was 1.0–1.8%.<sup>13</sup> A French study showed that among 1459 athletes, 4% admitted that they had consumed doping substances at least once in their lifetime.<sup>14</sup> A different study that used analytical chemistry to assess the prevalence of banned substance abuse between the top sports students detected that the prevalence of positive samples using urine was 11%, and the most often discovered substances were the primary metabolites of tetrahydrocannabinol (9.8%) and several stimulants related to amphetamines and cocaine (1.0%).<sup>15</sup> Ulrich's study showed that the probable prevalence of previous-year doping was 43.6% at World Championships in Athletics (WCA) and 57.1% (52.4–61.8) at Pan-Arab Games. The probable prevalence of previous-year use of supplements at Pan-Arab Games was 70.1%.<sup>16</sup> Nevertheless, the actual incidence of doping globally in top sports has still not been revealed. A blend of questionnaires and models of biological parameters suggests that the present prevalence of deliberate doping in top athletes ranges from 14 to 39%. This range differs with subgroups according to the sport type. The projected doping control test results confirmed an annual frequency of 1–2%.<sup>17</sup> On the other hand, 6.7% trusted that doping had no associated side effects.<sup>18</sup> Although manipulation in sports and needs for games have already been widely studied according to the reviewed literature, how each athlete participates and how demand is affected by manipulation have not been sufficiently studied thus far.<sup>19</sup> Some athletes have availed themselves of the extensive breadth of pharmaceutical research; however, proactive and preventive practices are required, such as the early application of new drug candidates and their metabolites into routine assays of doping control, even though many of these drug candidates are not approved to date for human use.<sup>20</sup>

The relationship between the abuse of banned substances and the lack of consequence awareness in the case of Saudi athletes' perception regarding the positive effects associated with banned compounds on enhancing performance emphasizes the requirement for immediate attention and education programs. Though the Awareness and Development Division of the Saudi Anti-Doping Program tried to increase awareness by conducting courses and conferences and producing publications about doping, the efforts during the period of the study were not good enough to cover the large number of facilities and athletes in the country. These programs need to be evaluated and audited to improve the outcome and help reduce the doping practice in the country.

This study is the only one in the region involving a large number of participants from all sports types and from various areas and facilities in KSA. The study has enriched the available data in this area of research, provided general perceptions, and recognized trends related to doping in the region. However, the study has the limitation of all questionnaire-based cross-sectional surveys – the possibility of recording bias owing to the sensitive nature of the subject matter. Abusing banned substances is a highly intimate issue that could potentially affect the athletes' future, which may

lead to underreporting and subsequent underestimation of the prevalence of doping in the country.<sup>21</sup>

The current study results highlight the need to fill the data gap related to doping, primarily within a Saudi context, in addition to raising the awareness of the sports associations with regard to youth banned substance abuse. Thus, it becomes imperative to heighten the understanding and consciousness of the association between participating in sports and banned substance abuse among the important stakeholders in youth sports.

## Conclusion

We have demonstrated that doping is a significant problem in KSA, although it is less than in many other countries. The number of positive samples was significantly higher for competing athletes compared to non-competing athletes. Although athletes believe that doping is against the spirit of sports and are aware of its consequences, they still abuse drugs. However, the actual prevalence rate for doping could be much higher due to the possible underreporting by some athletes because of the sensitive nature of the study's subject matter.

## Recommendations

1. Further efforts with regard to anti-doping screening, education and awareness will be required in order to ensure fair and safe play for all Saudi athletes.
2. SAADC should make use of its authority to introduce education initiatives and to study the impact of awareness campaigns on the prevalence of banned substance abuse between athletes.
3. Raising awareness and understanding about the link between participation in sports and banned substance abuse is vital to guarantee a positive sports experience for youth that is doping-free.
4. Educational efforts should focus on the adverse health consequences of abusing banned substances while promoting awareness of the fact that such behaviour is also forbidden.
5. Awareness programs should be especially directed to a target population of younger athletes particularly under the age of 20 with lower education levels.

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## Conflict of interest

There is no conflict of interest.

## Ethical approval

Ethical consent regarding the protocol of the study was granted by the Ethical Research Committee of King

Abdullah International Medical Research Center (KAIMRC) at King Saud bin Abdul-Aziz University for Health Sciences, Riyadh, KSA.

## Authors contributions

SOA, KIK, and AAAIlg conceived and designed the study, conducted research. MSK and AAAIm provided research materials and collected and organized data. SOA analysed and interpreted data. SOA, KIK, and AAAIlg wrote the initial and final draft of the article. MSK and AAAIm provided logistic support. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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