

## RESEARCH

# Knowledge and Perceptions of Pharmacy Students in Qatar on Anti-Doping in Sports and on Sports Pharmacy in Undergraduate Curricula

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**Objective.** To assess pharmacy students' knowledge and perceptions of doping and anti-doping in sports and to explore the curricular needs for undergraduate pharmacy in the field of sports pharmacy.

**Methods.** A cross-sectional, descriptive, web-based survey of pharmacy students was conducted at Qatar University College of Pharmacy from March to May 2014. Data were analyzed using descriptive and inferential statistics.

**Results.** Eighty respondents completed the online survey (80% response rate). Sixty percent were unaware of the World Anti-Doping Agency, and 85% were unaware of the International Pharmaceutical Federation's statement on the pharmacist's role in anti-doping. Students' knowledge score regarding the prohibited status of drugs that may be used by athletes was around 50%. Fourth-year pharmacy students had significantly higher knowledge scores than the other groups of students. Respondents acknowledged the important role of health care professionals, including pharmacists, as advisors on the safe and effective use of drugs in sports. Ninety percent of the students supported the inclusion of sports pharmacy in the curriculum.

**Conclusion.** Pharmacy students indicated a strong desire to play a role in doping prevention and ensure safe and rational use of drugs among athletes. They suggested requiring an education and training strategy for sports pharmacy in undergraduate pharmacy curricula.

**Keywords:** Anti-doping, sports, pharmacy, drugs, sports pharmacy, curriculum, Qatar

## INTRODUCTION

Sports have substantial socioeconomic and political importance worldwide and are today considered an integral part of society.<sup>1</sup> Pharmacists can be the first port of call for people engaging in sports who require advice on drug treatment or general health care. However, few pharmacy programs incorporate sports pharmacy as part of the curriculum, as illustrated by studies where pharmacy students in Japan<sup>2</sup> and Syria<sup>3</sup> did not have sufficient learning opportunities concerning doping in sports. Pharmacy graduates can, therefore, lack knowledge and skills about doping and anti-doping in sports and be ill-equipped to provide advice on safe, effective, and legal use of drugs for athletes.

Qatar plays a leading role in supporting sports nationally and globally, which has important implications in improving health-related quality of life of the people living in the country and beyond. Annually, Qatar hosts a significant number of local, regional, and international events, which will include the FIFA World Cup in 2022. Therefore, developing a pharmacy workforce or specialized pharmacists with expertise in sports pharmacy is a priority for Qatar, but also a subject of global health significance. Thus, pharmacy colleges and schools in the country may need to incorporate sports pharmacy content into their curricula.

Athletes experience significant social and commercial pressure to win and succeed in sports. This drives them to enhance their performance. Some resort to illegal performance-enhancing substances and/or prohibited methods such as blood transfusions.<sup>4</sup> The use of medications, dietary supplements, and other performance-enhancing substances is a widespread and challenging phenomenon.<sup>5</sup> Furthermore, athletes might unintentionally

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take prohibited substances, either through self-medication or physician prescription, as exemplified at the 2000 Olympic Games in Sydney, Australia, where a team physician prescribed a common cold medication, containing a prohibited drug, to an athlete.<sup>6</sup>

Performance-enhancing and image-enhancing drugs are used widely in society and more specifically within sports. For example, 1-3 million Americans<sup>7</sup> and 50 000-100 000 Swedes<sup>8</sup> have misused anabolic steroids, and 2.8 million US athletes have tried ephedrine as a stimulant.<sup>9</sup> Moreover, it was found that up to 5% of US high school students had used growth hormones to enhance their performance in sports.<sup>10</sup> In 2013, the World Anti-Doping Agency (WADA) reported 5271 adverse findings (positive test results for prohibited substances) globally. Of these, 3320 (63%) were for anabolic agents, 530 (10%) were for prohibited stimulants, and 393 (7.5%) were for diuretics and other masking agents.<sup>11</sup>

The agency was established in 1999 to promote and coordinate efforts against doping in sports. The agency publishes a list, "Prohibited Substances and Methods,"<sup>12</sup> which is updated annually in accordance with the World Anti-Doping Code.<sup>13</sup> The objectives of doping control are to guarantee equity and fairness between competitors and to ensure the safety of the athletes. Accordingly, articles 18 and 19 of the 2015 World Anti-Doping Code were approved and adopted at the fourth World Conference on Doping in Sports.<sup>13</sup> The articles stress the importance of education and research programs in preventing doping in sports. Such programs should be directed toward athletes and athlete support personnel, including health care professionals who not only ensure the health of athletes but also provide expert advice and support on the safe, effective, and legal use of drugs in sports. The International Pharmaceutical Federation (FIP), had previously recognized pharmacists' role in the fight against doping in sports with a statement that recommended that pharmacists should be updated with the contents of the WADA Code and should provide information to athletes to help them recognize the substances listed in the WADA Prohibited List.<sup>1</sup> In addition, the statement encouraged pharmaceutical agencies to provide pharmacists with continuing education about doping and the fight to control it.<sup>1</sup>

Thus, sports pharmacy involves the education and training of pharmacists to enable them to play an active role in anti-doping.<sup>14</sup> To date, few studies have evaluated the role and impact of pharmacists on anti-doping. This study aimed to evaluate the current knowledge about doping and anti-doping, the perceptions towards drug use in

sports, and views related to curricular need for sports pharmacy among pharmacy students in Qatar. In this context, sports pharmacy refers to the study of drugs used therapeutically for sports-related conditions and injuries and the misuse of drugs for performance enhancement in sports.

## **METHODS**

A cross-sectional descriptive, web-based survey was conducted among pharmacy students at the Qatar University College of Pharmacy. The college, established in 2007, is the first and only institution conferring a pharmacy degree in Qatar. The college currently has 3 approved academic degree programs: bachelor of science in pharmacy (BSc-Pharm), doctor of pharmacy (PharmD), and master of science (MSc-Pharm) in the pharmaceutical sciences and pharmacy practice.

The link to the self-administered SurveyMonkey (SurveyMonkey Inc., Palo Alto, CA) online web-based survey was sent via e-mail to all 94 BSc-Pharm and 6 PharmD students at the college. Given the small population of students at the college (100 students), we used universal sampling and no sample size was estimated for the study. The e-mail contained a statement of the study purpose along with the web link to the survey, which was made available for 2 months. Respondents were informed that responses to the questionnaire would be anonymous and no individual identifiers in the data were required. In order to increase the response rate, a bi-weekly e-mail reminder was sent over 2 months. The survey was closed and the final survey results were exported from SurveyMonkey to SPSS, v21 (IBM Corp, Armonk, NY).

An 18-item questionnaire was developed through an iterative process by the investigators, 2 of whom are experts in sports pharmacy. A thorough review was conducted of relevant literature pertaining to knowledge, views, and practices of pharmacists, pharmacy students, and other health care professionals towards the use of drugs in sports. The FIP Statement on pharmacists' role against doping in sports, the WADA List of Prohibited Substances, and the World Anti-Doping Code were also used in developing the survey. In addition to the demographic characteristics section (6 items), the questionnaire consisted of 3 main domains: (1) current knowledge regarding doping and anti-doping in sports (5 items); (2) views on the role of health care professionals in safe and effective use of drugs in sports (3 items); and (3) attitudes toward the content of sports pharmacy in pharmacy curriculum (4 items). In addition, one open-ended question asked respondents to provide additional comments regarding sports pharmacy.

The questionnaire was validated using both face and content validity by 2 experts in sports pharmacy. To ensure the content validity of the questionnaire, the first draft was reviewed by 2 pharmacy faculty members with experience in curriculum design, program learning outcomes assessment, and survey instruments development. Changes were made according to their suggestions, and the instrument was sent for face validation. The appropriateness, comprehensiveness, readability, and completion time of the survey items were pilot-tested among 6 recent pharmacy graduates. Many comments and suggestions were made, the majority of which were incorporated in the revised version of the instrument. A final version of the instrument was achieved through an iteration process among 4 of the 7 investigators. The study was approved by the Qatar University Institutional Review Board.

All data collected were analyzed using SPSS, v21. Both descriptive and inferential statistics were utilized for the data analyses. Frequencies and percentages were used to summarize all the responses generated from the survey. The influence of the respondents' demographic characteristics on knowledge, attitudes, and perception were tested using Mann-Whitney U test, Kruskal-Wallis test, or chi-square ( $\chi^2$ ) test as appropriate. The level of significance was set a priori at  $p \leq 0.05$ .

## RESULTS

Eighty students completed the online survey (response rate of 80%). All participants were female as currently the college admits only female students. The majority (75% - 81%) of the pharmacy students neither played nor watched sports on a regular basis. The socio-demographic characteristics of the pharmacy students who participated in the study and their awareness of the role of WADA and the FIP statement on the pharmacists' role on anti-doping are shown in Table 1. Eighty-nine percent of the participants agreed that performance-enhancing substances should be prohibited in sports. Three main reasons emerged: (1) using these substances is illegal (7 comments); (2) doping is a method of cheating (4 comments); and (3) drugs can be harmful to athletes (6 comments). Some comments respondents gave are quoted in Appendix A.

The knowledge assessment part of the study first evaluated the respondents' awareness of the role of WADA and the FIP statement. Sixty percent of respondents were unaware of WADA's role, and eighty-five percent were unaware of the FIP statement (Table 1). Eighty-seven percent of respondents were either unaware of the period of time imposed on an athlete who dopes, or incorrectly identified the true period of 2 years. On the

Table 1. Pharmacy Students' Characteristics and Awareness of Doping/Anti-Doping (n=80)\*

Characteristic/Awareness	n (%)
Gender	
Female	80 (100)
Pharmacy professional year	
1	18 (23)
2	21 (26)
3	17 (22)
4	19 (24)
PharmD	4 (5)
Watches sports	
Yes	15 (19)
No	64 (81)
Plays sports	
Yes	20 (25)
No	59 (75)
Supports prohibiting performance enhancing drugs in sports	
Yes	70 (89)
No	9 (11)
Aware of role of WADA	
Not at all	44 (60)
To some extent	29 (40)
A great deal	0 (0)
Aware of FIP statement on pharmacist's role in anti-doping	
Not at all	62 (85)
To some extent	10 (14)
A great deal	1 (1)
Time period an athlete is prevented from competing in sports if proven to have used a prohibited drug	
1 year	5 (7)
2 years	10 (14)
4 years	6 (8)
Lifetime	6 (8)
Don't know	46 (63)
% of athletes using dietary supplements for performance enhancement purposes	
1-20%	4 (6)
21-40%	9 (13)
41-60%	21 (29)
61-80%	25 (34)
81-100%	13 (18)

\* (n) values might not add up to 80 as there were missing values; WADA=World Anti-Doping Agency; FIP=International Pharmaceutical Federation

other hand, 52% of the participants believed that more than 60% of athletes used supplements to improve their performance in sports, a perception in accord with current thinking.<sup>15</sup>

Eight substances that might be used by athletes were chosen in order to evaluate the participants' knowledge

regarding doping in sports. Respondents were asked to classify the substances as prohibited, not prohibited, or do not know, according to their status on the WADA list. The list included more widely known performance-enhancing substances such as anabolic steroids and amphetamines, as well as less-recognizable prohibited drugs, including insulin and cannabis. The list also included substances permitted for use by athletes while competing such as paracetamol, antihistamines, codeine, and caffeine. The majority of the students classified certain substances correctly in relation to their use in sports, including anabolic steroids (65%), amphetamines (72%), paracetamol (88%), and antihistamines (61%). Conversely, a large percentage of respondents were unable to identify the correct prohibited or permitted status of insulin (85%), codeine (86%), and caffeine (56%) (Table 2).

A scoring system was adopted to quantify respondents' knowledge on the prohibited status of drugs. One point was awarded for each correct response in the substance list shown in Table 2, giving rise to a maximum knowledge score of 8. The overall knowledge score of participants showed a mean (SD) of 4.1 (1.7) and median (inter-quartile range) of 4 (2). Inferential analysis of socio-demographic factors that might affect participants' knowledge regarding anti-doping was conducted. This indicated that watching sports was significantly associated with increased knowledge score among the students ( $p=0.04$ ). In addition, there was a significant increase in students' knowledge as they progressed through their degree program ( $p<0.001$ ). However, none of the socio-demographics of the participants significantly influenced their awareness of WADA's role or the FIP Statement.

Participants were asked to rate their perception on athletes' use of some sources of information about the safe and effective use of drugs in sport, using a scale from 1 (infrequently consulted) to 5 (very frequently consulted). Figure 1 shows that, overall, each of the sources

of information was perceived to be used equally. Similarly, when asked to rate the reliability of these sources of information (1=unreliable to 5=very reliable), respondents believed that other athletes and Internet search engines were the least reliable sources of information. Health care professionals were rated as the most reliable source of drug information for athletes with an average rating score of 4.6. All respondents believed that pharmacists (if appropriately trained) should be consulted by athletes to provide help and advice on the safe and effective use of drugs in sports. Approximately 90% of the students supported the concept of incorporating sports pharmacy into the pharmacy curriculum (Table 3).

### DISCUSSION

Pharmacists have a potentially significant role to play in doping prevention and in promoting the rational, safe, and effective use of medications in sport.<sup>16-18</sup> The results of our study may be useful in considering the incorporation of sports pharmacy into the pharmacy curricula. This issue is rarely documented in the literature. Therefore, this project adds important information to the literature and addresses the FIP position statement related to the role of pharmacists in sports. It also supports the recommendations of WADA to increase education and awareness of anti-doping throughout the medical profession.<sup>13</sup>

The majority of the students classified certain substances correctly in relation to their legal status in sports. For instance, anabolic steroids and amphetamines were correctly classified as prohibited possibly because anabolic steroids and amphetamines are well documented as performance-enhancing drugs. Similar findings were reported by a study conducted in Syria.<sup>3</sup> Paracetamol and anti-histamines were correctly classified as nonprohibited items which can, in part, be explained by their wide use in society. Although, cannabis and caffeine were generally correctly classified as prohibited and nonprohibited,

Table 2. Pharmacy Students' Classification of Substances in Relation to Their Prohibited Status in Sports (n=80)\*

Substance	Prohibited n (%)	Not Prohibited n (%)	Don't Know n (%)	Prohibited Status
Anabolic Steroids	47 (65)	6 (8)	20 (27)	Prohibited
Amphetamines	52 (72)	2 (3)	18 (25)	Prohibited
Paracetamol	1 (1)	62 (88)	8 (11)	Not prohibited
Anti-histamines	4 (6)	43 (61)	23 (33)	Not prohibited
Insulin	11 (15)	41 (58)	19 (27)	Prohibited
Cannabis	37 (50)	2 (3)	34 (47)	Prohibited
Codeine	44 (61)	10 (14)	18 (25)	Not prohibited
Caffeine	16 (22)	32 (44)	25 (34)	Not prohibited

\*(n) values might not add up to 80 as there were missing values

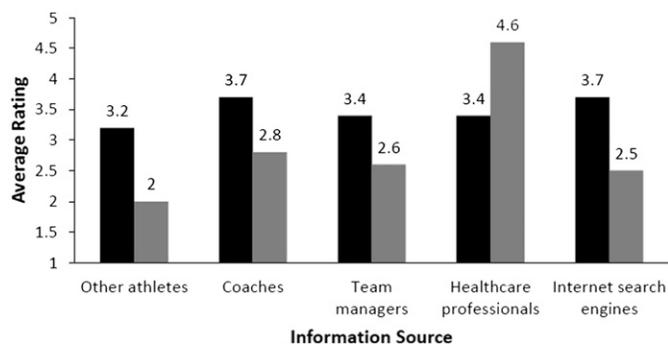


Figure 1. Pharmacy students' perception of information sources athletes are using to obtain information about drugs use in sports (black columns) and their perception of information sources athletes should use to obtain information about drugs use in sports (gray columns).

respectively, many students were uncertain about their permitted or prohibited status in sports. The majority of the respondents did not classify insulin and codeine correctly. Generally, pharmacy students demonstrated a reasonable degree of knowledge about anti-doping with an overall knowledge score of 50%. This result is unsurprising because pharmacy students typically have a good knowledge of drug action and use, which would help them indicate each drug's potential for performance enhancement.

As students progressed through their pharmacy program, their knowledge about anti-doping and use of that knowledge to predict the performance-enhancing properties of drugs increased linearly ( $p < 0.001$ ). In addition, watching sports regularly, defined as at least once weekly, significantly affected the students' knowledge regarding anti-doping in sports ( $p = 0.04$ ). This result might be explained by greater exposure to cases of anti-doping rule violations through the media. On the other hand, playing sports had no significant effect on knowledge of the prohibited status of drugs ( $p = 0.95$ ).

The majority of the participants were not aware of either the role of WADA or the FIP statement of the pharmacists' role in anti-doping. Inferential analysis on the effect of participants' socio-demographic and professional characteristics on their awareness of both WADA and FIP statement showed insignificant results. The progression through the pharmacy program did not have an impact on awareness of WADA or FIP statement as sports pharmacy was not included the curriculum at the college. Moreover, watching sports did not result in increased awareness of WADA or the FIP statement. The majority of participants reported that health care professionals were the most reliable source athletes could rely on for information on safe and effective use of drugs and

Table 3. Pharmacy Students' Views on Sports Pharmacy Content in Pharmacy Curricula (n=80)\*

Item	Response n (%)
Supports incorporation of sports pharmacy into pharmacy curricula	
Yes	62 (90)
No	7 (10)
Sports pharmacy content as	
Core course	2 (3)
Elective course	21 (34)
Part of a course	39 (63)
Credit hours of sports pharmacy in curricula	
1	54 (87)
2	8 (13)
3	0 (0)
4	0 (0)

\* (n) values might not add up to 80 as there were missing values

that pharmacists had an important role to play in that context.

The study raised awareness among participating students on the potential role of pharmacists in anti-doping and sports. In alignment with previous studies,<sup>2,3</sup> our study demonstrated that pharmacy students support sports pharmacy being incorporated into the curriculum. Settings proposed for sports pharmacy content include the classroom, postgraduate training, and experiential programs.<sup>5</sup> There may be a need for core or elective courses on the basic principles of drug use and misuse in sports as part of undergraduate curricula in pharmacy. Elements of sports pharmacy that could be incorporated include the regulation of drug use in sports, substances and methods prohibited in sports, systems for doping control, and pharmacy clinical services to advise and support individuals who participate in sports and exercise. Pharmacy educators should work closely with sports pharmacy experts and relevant national and international organizations and stakeholders to design standardized course syllabi that address the safe and effective use of medications in sports. A continuing professional development module could also be designed for training practicing pharmacists to play a more effective role in sports events and/or work in association with hospitals or clinics that primarily focus on sports patients.

This study had limitations and potential biases inherent to surveys. In particular, limitations pertained to the study instrument and the study population. First, the instrument did not cover all circumstances under which athletes may take drugs.<sup>19</sup> In particular, the study did not fully explore knowledge of nonprescription

performance-enhancing substances, which are medications athletes can easily purchase from community pharmacies. Second, the study included only female students. Male students may be more interested in sports, which may influence their knowledge and perceptions of anti-doping and pharmacists' role in sports.

## CONCLUSION

Pharmacy students at Qatar University College of Pharmacy had some basic knowledge and positive attitudes towards anti-doping in sports, although sports pharmacy was not incorporated in the pharmacy curriculum at the time of the survey. However, knowledge gaps need to be bridged. In general, students surveyed indicated interest in participating in doping prevention and recognized the role pharmacists could play in that area. This study has implications for developing and introducing course modules or contents related to sports pharmacy. This would further support WADA recommendations on the importance of education programs on preventing doping in sports

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## Appendix A. Sample Student Reasons for Prohibiting Performance-Enhancing Substances in Sports

"If an individual is doing sports to enhance his/her quality of life, taking drugs to enhance the performance may cause harm later on, especially if a person gets addicted in competitions. I think it is illegal and unfair to take drugs that can make you perform better. And if a person felt that these drugs are really helping or effective, s/he might become an addict and in the long run, this might affect his real capabilities to perform any activity without these drugs (dependency)."

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“From ethical point of view, because by using these drugs, you are enhancing the performance of the athletes by external factors not by training which can be unfair if you compare them with other talented athletes who are not taking this type of medications. Second, there is no clinical indication to use these drugs like for example growth hormones in healthy people just to build muscles and win a competition. Third, giving a drug predispose them at the end of the day to side effects and some can be addicted to this type of drugs, and we have heard a lot about athletes died from overdosing themselves and others were disqualified and became unable to continue in their career.”

“It is unfair for individuals to train day and night to achieve a goal in order to enhance their athletic abilities and others can do so by simply taking a certain medication.”