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Research Article

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Descriptive Cross-Sectional Assessment of Pharmacists' Knowledge and Involvement in Sports Anti-Doping Initiatives in Albayda City, Libya

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ABSTRACT

The worldwide abuse of performance-enhancing drugs (PEDs) continues to be a significant issue, with incidents of doping rising consistently, as stated by the World Anti-Doping Agency (WADA). A significant proportion of unintentional doping incidents arises from athletes' limited awareness regarding the substances they consume. Although athletes hold the main responsibility for the substances they take, healthcare professionals, such as pharmacists, are crucial in reducing the chances of accidental doping. The purpose of this study is to assess the pharmacists' knowledge, attitudes, and perceptions regarding doping and anti-doping practices. A descriptive cross-sectional study was conducted involving 200 pharmacists in Albayda, Libya. Data were collected using a structured 15-item questionnaire designed to assess pharmacists' understanding and perspectives on doping. Our findings revealed that only 7% of pharmacists were familiar with the term "doping," and a mere 1% had previously attended any formal training or lectures on the topic. Nevertheless, a significant majority (89%) concurred that utilizing banned substances in sports is both unethical and unjust. The awareness regarding the potential presence of prohibited substances in over-the-counter medications and dietary supplements was limited to 22%. Additionally, merely 1% of the participants recognized the International Pharmaceutical Federation's (FIP) official position concerning the involvement of pharmacists in anti-doping efforts. On a positive note, 90% of the respondents indicated a strong desire to undergo formal training in the area of anti-doping, while 75% favored the development of sports pharmacy as a specialized discipline. These findings highlight a critical need for improved anti-doping education within pharmacy training programs to properly equip future pharmacists for their responsibilities in promoting clean and ethical sports.

Key words-Doping in Sports; Anti-Doping Education; Pharmacist Role in Sports; Performance-Enhancing Drugs (PEDs); World Anti-Doping Agency (WADA).

INTRODUCTION

The problem of doping in sports is widespread and has been existed for more than a hundred years in different types of athletic sports.[1,2] Athletes have been found using various performance-enhancing drugs, including anabolic steroids, stimulants, human growth hormone, and genetic modification techniques called gene doping. [3-5] Although numerous elite athletes have been discovered using these substances, both national and international regulatory organizations have redirected their attention in recent years from merely identifying drug use to also comprehending the behaviors and practices that contribute to it.[6,7] At the professional level, athletes might resort to using substances for quicker recovery, to manage injuries, or to achieve a competitive advantage.[8,9] According to WADA, the percentage of adverse analytical findings (AAF)—which indicate the detection of banned substances—increased from 0.65% in 2021 to 0.77% in 2022.[10,11] This uptick implies a rise in instances of doping.[12] The World Anti-Doping Code (WADC) describes doping as one or more breaches of anti-doping regulations, which include the presence of banned substances in an athlete's sample and aiding others in violating these regulations.[13] Doping is becoming more complex, involving not only drugs but also mechanical aids and biological manipulation. It is now viewed as a major public health issue. Governments and sports organizations are investing heavily in scientific research, improved drug detection methods, education programs, stricter policies, and tougher penalties to tackle the problem.[14-16] However, the prevalence of PEDs remains a significant issue in sports.[17] Doping violations can be intentional or accidental. For instance, at the 2000 Sydney Olympics, an athlete tested positive because a team doctor unknowingly administered a common cold medication that included a prohibited substance.[18] In many cases, athletes are unaware of the substances they are consuming, which is a major cause of unintentional doping.[19] Although athletes are ultimately responsible for what they consume, healthcare professionals, especially pharmacists, have an important role to play in preventing accidental doping. By educating athletes on safe medication use and providing evidence-based guidance,

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pharmacists can help minimize the risks of doping. They can assist a range of individuals—from casual gym-goers to elite athletes—by advising them on supplement safety and compliance with anti-doping regulations. In fact, the FIP issued guidelines in 2005 outlining how pharmacists can help combat doping in sports. Interestingly, the misuse of performance- and image-enhancing drugs is not limited to professional sports. In the United States, approximately 2.8 million athletes have taken ephedrine as a stimulant, while between 1 and 3 million Americans and 50,000 to 100,000 Swedes have used anabolic steroids.[20] However, studies suggest that many community pharmacists still lack the proper knowledge to guide athletes on safe drug use in sports.[21,22] One possible reason for this is that pharmacy education often does not include specialized training on doping-related topics. In India—a country that actively supports sports—there is a growing need to train pharmacists in sports pharmacy so as to contribute to global health and athlete safety.[23] In order to address this necessity, pharmacy schools should think about incorporating sports pharmacy into their curricula. Providing education at the undergraduate level can greatly enhance pharmacy students' comprehension of doping and raise their awareness of the ethical and health implications associated with sports. For example, the Advanced Pharmacy Practice Experience (APPE) program at the University of California helps students gain confidence in handling drug testing procedures and better understand doping-related challenges.[24] Pharmacists are uniquely qualified to support anti-doping efforts because they are trained to manage drug records and stay up-to-date on lists of banned substances.[25-27] Therefore, this study aims to assess the knowledge, attitudes, and opinions of pharmacists in Albayda, Libya, regarding doping in sports.

MATERIALS AND METHODS

Study setting and period

This descriptive cross-sectional study was conducted between January and August 2025 in Albayda, Libya, specifically involving pharmacists residing or working in the area.

Source and study population

The study population comprised graduated pharmacy students, including those who hold a Bachelor of Pharmacy (BPharm) or Master of Pharmacy (MPharm) degree. A total of 200 participants were included. Eligibility criteria required that participants voluntarily consent to take part in the study. The dependent variables were the participants' knowledge, attitudes, and perceptions regarding doping and anti-doping measures. The independent variables included the socio-demographic characteristics of the respondents.

Data collection and statistical analysis

Data were collected through a structured, self-administered questionnaire as part of a cross-sectional survey. A 15-item instrument was designed following an extensive literature review focusing on the knowledge, attitudes, and perceptions of pharmacists, pharmacy students, and other healthcare professionals regarding doping in sports. After data were collected, they were coded and transferred into Excel program of Microsoft Office for analysis.

The questionnaire was organized into three core domains:

1. Knowledge regarding doping and banned substances.

2. Perceptions and opinions about the role of sports pharmacists.

3. Attitudes and interest toward anti-doping education and training.

The survey included several multiple-choice questions and aimed to assess the understanding of prohibited substances. The first three questions collected demographic information, such as age, gender, and educational background. The remaining twelve questions explored the respondents' comprehension of the concept of doping, their views on doping in sports, and their perception of how increased awareness and education may help reduce doping practices. Questionnaires were distributed directly to pharmacists, with follow-up reminders sent to ensure completion. Participants received complete information regarding the objectives of the study and were guaranteed that their participation would be voluntary, anonymous, and confidential. Only those who gave informed consent were considered for the final analysis. All 200 of the distributed questionnaires were filled out and returned to the researchers. The majority of respondents held a Bachelor of Pharmacy degree (n = 189; 90%), while the remainder held other qualifications (n = 11; 10%). All participants were between the ages of 25 and 30 years.

RESULTS

A total of **200 pharmacists** successfully completed the questionnaire, yielding a **100% response rate**. The **socio-demographic characteristics** of the participants, as well as their involvement with and perspectives on anti-doping practices, are presented in **Table 1**. This table provides a detailed overview of the respondents' backgrounds and highlights their potential roles in supporting anti-doping efforts within the pharmacy profession.

Table 1: Socio-demographic characteristics of study respondents (n = 200).

Variables		Frequency (n = 200)	Percentage (%)
Age	≥ 25	120	75
	< 25	80	25
Gender	Male	140	78
	Female	60	22
Program	BPharm	189	90
	Other	11	10

Among the 200 respondents, 78% were males, while 22% were females, indicating a predominance of male

participants in the study. Regarding awareness, only 7% of the participants reported familiarity with the term "doping," and just 1% had previously attended a lecture or seminar on the subject. The vast majority (99%) had not received any formal education or training related to doping. A significant proportion of respondents (89%) expressed belief that the use of prohibited substances by athletes to enhance performance is unethical and unfair. While 22% were aware that over-the-counter (OTC) medications and dietary supplements may contain banned substances, a notable proportion of the participants (11%) were unaware that the ingredient lists on nutritional supplements might not disclose the presence of prohibited substances. Regarding professional awareness, only 1% of pharmacists were familiar with the FIP statement on the role of pharmacists in anti-doping, while 99% had no prior knowledge of this. Nevertheless, an overwhelming majority (98%) agreed that pharmacists should play an active role in establishing anti-doping measures among athletes. Furthermore, 90% of respondents expressed interest in receiving training related to doping and anti-doping practices. A total of 124 (75%) participants supported the idea of advancing the field of sports pharmacy as a specialized area of practice. The attitudes and perceptions of pharmacists toward doping and their professional responsibilities in this domain are summarized in Table 2. Additionally, the participants were asked to evaluate their knowledge of substances banned by WADA. The extent to which they were able to identify prohibited substances is detailed in Table 3.

Table 2: Attitudinal and perceptual analysis of graduate pharmacy students on doping and anti-doping issues (n = 200).

Questions	Yes	No
Are you familiar with the concept of doping in sports?	7%	93%
Did you attend any doping-related educational programs?	1%	99%
Are you aware of the International Pharmaceutical Federation (FIP) statement on the pharmacist's role in anti-doping?	1%	99%
Do you know about the concept of Therapeutic Use Exemptions (TUEs)?	11%	89%
Did you know that over-the-counter (OTC) medications and dietary supplements might contain prohibited substances?	22%	78%
Is it fair for athletes to use banned substances to enhance performance?	89%	11%
Do you believe athletes should never be allowed to use prohibited substances for legitimate medical treatment?	45%	55%
Do you believe pharmacists have a crucial role in sports pharmacy?	89%	11%
Are you interested in receiving formal training on anti-doping practices?	90%	10%
Are you interested in developing a career in sports pharmacy?	75%	25%

Table 3: WADA-banned substances recognized by graduate pharmacy students.

WADA Banned Substances	Number of Pharmacists (n = 200)	Percentage (%)
Ibuprofen	30	15
Dexamethasone	11	3
Acetazolamide	*45*	*22*
Terbutaline	20	12
Methylprednisolone	34	16
Levosalbutamol	20	12
All the above	40	20

As shown in Table 3 above, only 20% of pharmacists correctly identified WADA-banned substances. Among the healthcare and support professionals considered appropriate advisors on the use of drugs and supplements in sports, nutritionists were most frequently recognized as correctly identifying WADA-prohibited drugs (42 responses). Other professionals identified included coaches and trainers (with 38 correct responses), pharmacists (with 38 correct responses), doctors (with 26 correct responses), and nutritionists (with 22 correct responses). The remaining participants were unable to accurately identify banned substances as defined by WADA. These distributions are illustrated in Figure 1.

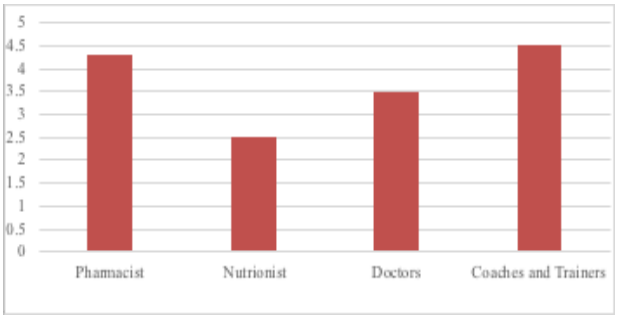

Figure 1: Pharmacists' responses regarding which professional groups should receive guidance on the use of drugs and dietary supplements in sports

DISCUSSION

This study aimed to assess the knowledge, attitudes, and perceptions of graduate pharmacy students concerning doping and anti-doping measures in sports. Future pharmacists are uniquely positioned to provide critical guidance regarding the safe use of medications and nutritional supplements among athletes.[28,29] This study's findings reveal that most graduate pharmacy students were only vaguely familiar with the term "doping," with very few having attended formal educational sessions on the topic. Similar results were observed in a comparable study conducted in Japan, where the majority of pharmacy

students had merely heard of doping. Although pharmacy curricula often cover both the therapeutic benefits and adverse effects of medications[30], students struggle to distinguish these drugs based on their potential for doping. A significant proportion of respondents were unable to accurately identify substances prohibited by WADA, consistent with findings from studies conducted in Syria and other countries.[31-34] While most participants were aware that OTC medications and dietary supplements might contain banned substances, many were unaware that some of these substances may not be explicitly listed on product labels.[35] Notably, 94% of the participants reported unawareness regarding the presence of banned compounds in OTC products. Given that pharmacists' lack of knowledge may inadvertently harm athletes, it is essential to incorporate this information into pharmacy education. Doping encompasses not only the use of prohibited substances or methods by athletes but also the involvement of any individuals who assist, encourage, facilitate, conceal, or otherwise support doping violations, including any form of international collaboration aimed at breaching anti-doping regulations. Pharmacists equipped with specialized anti-doping training and adequate expertise are, therefore, well-positioned to contribute significantly to doping prevention.[36] Research has demonstrated that fewer than half of general practitioners (GPs) and pharmacists (45%) in South Africa are aware of organizations or services in the country dedicated to combating doping in sports.[37,38] Despite the accessibility of such information, healthcare professionals often do not remain current with the evolving list of banned substances. Additionally, less than 25% of practitioners reported familiarity with the standard drug testing procedures used to handle athlete biological samples in South Africa.[39] Pharmacists are more likely than GPs to possess the latest WADA Prohibited List, with only 39% of GPs reporting possession of this resource.[40] In light of these findings, universities should integrate comprehensive doping-related topics into their curricula, employing engaging teaching strategies to enhance pharmacy students' interest and understanding. The current study indicates that pharmacy students demonstrated an overall anti-doping knowledge and perception level of approximately 50%, reflecting moderate understanding. Given their in-depth knowledge of drug mechanisms and clinical applications, pharmacy students are well-equipped to evaluate the performance-enhancing potential of various substances.[41] Furthermore, the role of sports pharmacists extends beyond direct interaction with athletes and coaches to include collaboration with fellow pharmacists and pharmacy students.[40,42] This broader engagement is critical, as general pharmacists will increasingly require comprehensive knowledge of doping regulations and dietary supplement use. It should be noted that this study's generalizability is limited, as it was conducted at a single pharmacy college in Libya and may not fully represent the perspectives of pharmacy students across the country.

CONCLUSION

The study underscores the necessity of equipping pharmacy graduates with comprehensive theoretical knowledge and practical competencies regarding doping, alongside ongoing updates in this evolving field. The results indicate a significant gap in anti-doping awareness among pharmacy graduates, highlighting the importance of enhanced education and training programs. Incorporating anti-doping content into pharmacy curricula is crucial to adequately prepare future pharmacists to effectively contribute to promoting ethical and fair practices in sports.

RECOMMENDATIONS

The researchers recommend that anti-doping topics be integrated into the pharmacy curriculum, regular seminars and workshops be organized for graduates, and collaboration be established with sports organizations and anti-doping agencies. Continuous training and community awareness programs should also be encouraged to strengthen pharmacists' roles in promoting clean sports.

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