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RESEARCH PAPER

Knowledge, Awareness, and Attitudes towards Doping among Biochemistry University Students

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ABSTRACT

The use of prohibited performance-enhancing substances in sports remains a pertinent issue with significant health and ethical issues. Hence, investigating the knowledge, attitude and awareness of biochemistry students towards doping was the main aim of this study. A total of 203 students (164 females and 39 male) from five different universities, voluntarily engaged in this cross-sectional study. The age of these participants ranged from 20-24 years (M = 21.96, SD = 0.961). The findings demonstrated that a considerable percentage of participants are familiar with banned substances due to their biochemistry background. However, there were notable misconceptions as a significant proportion of participants failed to identify these substances as prohibited. These results emphasize the significance of targeted educational interventions aimed at rectifying misconceptions and promoting ethical principles. Furthermore, the influence exerted by coaches, peers and media in building students' perspectives underscores the necessity for comprehensive awareness campaigns that engage multiple stakeholders.

KEYWORDS Attitude, Awareness, Bio-Chemistry Students, Doping, Knowledge

Introduction

Doping pertains to administering substances or methods prohibited to athletes (Saito et al., 2013). It encompasses the illegal and artificial use of substances as well as strategies that can be forbidden to enhance physical and intellectual performance (Unal & Unal, 2004). The World Anti-Doping Agency unequivocally bans doping, including any action that assists, encourages, or promotes violation of the doping regulations. Doping is acknowledged as a significant concern for sportsmen both within and beyond competitive sports at international level (Al Ghobain et al., 2016).

Doping agents can be classified into three primary groups: substances that are universally unlawful like peptide hormones or anabolic steroids; substances that are banned exclusively during competition such as stimulants, consisting of both optical isomers or glucocorticoid steroids; and substances that are outlawed in specific sports, like alcohol or beta-blockers (Saito et al., 2013). Energy drinks are crafted to be more than regular espresso. They are infused with a dynamic blend of taurine, potent herbal extracts and essential minerals that provide a stimulating effect on both mind and body (Badr el Dine & Attia, 2022).

For decades, numerous professional athletes have relied on illegal substances, particularly during competition, to boost their performance (Al Ghobain et al., 2016). For more than three decades, sportsmen have turned to steroids in an attempt to enhance their abilities demanding substantial strength and endurance (Boyack, Klavans, & Börner, 2005). The medical literature has frequently documented instances of steroid use among adolescents (Boyack et al., 2005) The prevalence of energy drink consumption has increased significantly, particularly among adolescents. This age range is specifically targeted as younger people tend to be more attuned to global trends (Badr el Dine & Attia, 2022).

The realm of bodybuilding often finds itself intertwined with the consumption of prohibited substances. A study highlighted that there is an elevated average intake of NS, including whey protein, creating, complex vitamins, and caffeine, which may improve athletic performance (Boyack et al., 2005). Elite athletes as compared to their less athletic counterparts, do require illegal substances for managing medical concerns. Unfortunately, the outstanding athletic achievements of clean athletes are overshadowed by the specter of illegal substances that enhance performance (Boyack et al., 2005)

Previous studies have also indicated that doping might cause detrimental diseases, such as heart, lung, and vascular conditions, that have a major impact on sexual function, behavioral changes, and mood disorders (Al Ghobain et al., 2016). Presently, these illicit substances are routinely exploited by professional sportsmen to cheat the system and achieve swift success with minimal effort. Whereas, the association of doping with substantial health hazards, particularly with cardiovascular issues is undeniable. (Deligiannis & Kouidi, 2012). Apart from its effects on bone metabolism, excess use of performance-enhancing drugs might result in soft tissue edema and extreme swelling of the hands and feet. Athletes should be advised to avoid using doping substances to reduce the risk of getting cancer (Nikolopoulos, Spiliopoulou, & Theocharis, 2011).

It is important that the general public, besides athletes, be educated about both the correct intake of drugs and anti-doping activities as this could ultimately assist people in understanding the misuse of drugs (Shibata, Ichikawa, & Kurata, 2017). Previous studies have also shown the need to carry out doping and PED awareness program among doctors and chemists worldwide (Saito et al., 2013). Additionally, other professionals including coaches, trainers, dieticians, and sports managers should also be included in such programs (Salih & Abd, 2021).

The desire for supremacy, dominance and even fame often motivates athletes to experiment with both legal and illegal performance-enhancing drugs or techniques. Notably, the issue of doping is no longer confined to professional athletes, rather numerous studies have revealed the presence of doping substances among young athletes, amateurs and gym-goers (Mazen El-Hammadi & Bashar Hunien, 2013). Athletes are looked up as role models in society therefore their actions can directly impact impressionable young minds (Gebregergs Hailu, Yirsaw Gobezie, Tuha, Mulugeta, & Ahmed Mohammed, 2021). Hence professional athletes should establish exemplars that would ultimately inspire and motivate young athletes to enhance their abilities through natural means.

In the domain of athletic medicine, biochemistry is gaining prominent recognition regarding early detection and diagnosis worldwide (Banfi & Dolci, 2003). The preanalytical phase, which entails the collection of biological material, identification of the specimen, storage and transport, and preparation of the specimen for evaluation through centrifugation, freezing and thawing has a significant impact on the analytical process and the overall laboratory quality (Banfi & Dolci, 2003). In order to prevent incorrect data interpretation and to increase the value of biochemical investigations, this study will bring

about the connection between the growing interest in sports biochemistry and an understanding of the key issues in the preanalytical phase. This study might also help to assess a variety of parameters, which are frequently used to monitor training, diet, and performance of athletes (Banfi & Dolci, 2003).

Literature Review

A study was conducted on the knowledge, attitude, and responsibility perspectives of Pakistani pharmacy graduates. 300 pharmacy students from two different universities in Pakistan were involved in the study. Participants were made aware of the goals of the study and their right to withdraw after the ethics board gave the study approval. According to the findings, the majority were not aware of the legal meaning of common substances, and one-fourth had a bad opinion of doping. This recommends that doctor of pharmacy programs in Pakistani institutions should add courses on prohibited or allowed drugs, doping and ethics, health, and doping drugs (A. ALI, 2016).

Another study on medical students' perceptions, knowledge, and attitudes surrounding the abuse of performance-enhancing drugs (PEDs) in athletics and academic work was conducted. Utilizing logistic regression models, data from 208 participants of both sexes were gathered and examined. The findings indicated that while female students had a greater comprehension of the detrimental effects of PES usage, more than half of the participants had no knowledge of the laws pertaining to the use of doping drugs. Male participants made up 45.5% of the participants, while female participants made up 54.5%. The age range was 18 to 26 years, with a 22.04 - 1.08 years average. The questionnaire demonstrated internal consistency and reliability, with a knowledge Cronbach's alpha of 0.850 and a perception Cronbach's alpha of 0.756. The suggestion was 0.523, and the proper responses to inquiries about caffeine, Panadol, and the legality of energy drinks during competition were no and yes (Badr el Dine & Attia, 2022).

A third study, comprising of 61 chemists in Dessie, Northeast Ethiopia was carried out. Men (75.4%) and women (24.6%) made up the majority of the respondents, and 41.0% and 21.3% of them reported regularly participating in and watching sports. The majority favored outlawing medications that increase athletic performance. Merely 27.9% of respondents acknowledged the World Anti-Doping Agency (WADA) as an information source, yet the majority thought that pharmacies may be a source of doping agents. Being a man and regularly watching sports were two factors linked to knowledge. The findings revealed that 80.3% of respondents achieved a score of seven or lower. Furthermore, a notable 55.7% of respondents concurred that pharmacists could be a viable source of doping, and 50% supported the restriction of substances that improve performance in sports. The creators of pharmacy curricula should think about including particular lessons or subjects regarding doping agents (Gebregergs Hailu et al., 2021).

Similarly, another study comprising of pharmacy students was conducted to understand their knowledge of the doping agents used in sports, as well as their attitudes towards doping and drug abuse. Results revealed that 90% of the respondents were unaware that drugs like diuretics, heroin and beta-blockers were employed as agents of doping, whereas more than 75% believed that supplements like vitamins, energy drinks, and amino acids may improve performance. Furthermore, 15% of participants had either used or planned to use doping agents. The study emphasizes the necessity of giving pharmacy students a thorough academic foundation and hands-on training in doping, which may be accomplished by making adjustments to the present curricula (M El-Hammadi & B Hunien, 2013).

In contrast a comparable study conducted in Japan with the objective of evaluating the knowledge of pharmacy students with proper drug utilization revealed disconcerting trend. However, a substantial 72% of respondents conveyed their keen interest in participating in such enlightening sessions. Many students were unaware that unintentional doping, which happens to be the predominant violation in Japan and lacked knowledge about past doping cases. Furthermore, a significant portion of students remained uninformed about the potential inclusion of prohibited substances in dietary supplements. Nonetheless, engagement in a doping focused lecture proved influential in improving students' understanding in all these areas. The study concludes that it is crucial to provide pharmacy students with more opportunities for education on doping, as their interest exists, and such education would contribute to anti-doping efforts similarly to educating athletes (Shibata et al., 2017).

Material and Methods

This study aims to explore "Knowledge, Awareness and Attitude towards Doping among Biochemistry University students". The research methodology encompasses of research design, target population, size of sample, sampling technique and the procedure adopted for data collection.

Design of study

Cross-sectional design of study was opted in order to execute this research on a group of biochemistry students enrolled in different universities in Pakistan encompassing both public and private universities.

Participants

A total of two hundred and three students, out of which 164 were female and 39 were male, voluntarily engaged in this study. The age of these participants ranged from 20-24 years (M = 21.96, SD = 0.961). Students were engaged from semesters seven and eight from all five universities. The participants were informed of the study's aim before data collection. All participants received the assurance that the data collected would be kept totally private. Additionally, they were made aware of their freedom to refuse to participate in the study.

Questionnaire Development

The questionnaire was developed by EL. Hammadi and Hunien in 2013 (M El-Hammadi & B Hunien, 2013) and was previously used by A. ALI, M. A. ANSARI in 2016. (Ali et al., 2016). This questionnaire comprises of 32 questions. After obtaining formal authorization from the author via email, this questionnaire was transformed into data collection tool.

Instrument

This questionnaire comprises of 5 parts: 1st part is the demographic part that includes (the name of the university, department, year of study, age, gender, marital status, athlete or non-athlete and lastly employed or unemployed). The 2nd part accumulates data on the knowledge of doping. Some changes has been made in this part which consists of two questions, two more questions have been added which were considered necessary (caffeine and cocaine)(Odeh, Tailakh, Al Bawab, Elsahoryi, & Alzoubi, 2022). The third section encompassed four items designed to ascertain the underlying purpose behind the utilization of doping substances. Similarly, the fourth section aimed at gauging attitudes

towards prohibiting substances. The fifth segment comprised of four questions that were addressing general perspectives on doping. Finally, the questionnaire concluded with a pair of inquiries concerning instances of exposure and the influential factors guiding doping behaviors.

Procedure

The information of the enrolled students was taken from the department of biochemistry of all five universities. Subsequently, the procedure of data collection was initiated and the data of the last two semesters (7th, and 8th) of all five universities was collected. The participants were instructed to completely fill out the form with their accurate opinions and submit it to the researcher as soon as they were done. Only students who volunteered to take part in the study were given questionnaires. The participants were asked to spend as much time as necessary to complete the questionnaire comfortably and easily. When filling out the questionnaire, participants were specifically requested to give their sincere views. The participants were also free to ask any questions they had about completing the questionnaire.

Data Analysis

Using SPSS software, percentages and frequencies were computed for each response in order to facilitate the analysis of the collected data.

Results and Discussion

Table 1
Demographic characteristics of the participants

Variables	***f (%age)***
University	
1	51(25.1)
2	39(19.2)
3	38 (18.7)
4	57(28.1)
5	18 (8.9)
Year of Study	
7th semester	33(16.3)
8th semester	170(83.7)
Gender	
Male	39(19.2)
Female	164(80)
Marital status	
Married	4(2)
Unmarried	199(98)
Athletic status	
Yes	25(12.3)
No	178 (87.7)
Professional Status	
Employed	14(6.9)
Unemployed	189(93.1)

Note: N=203, *f=frequency, %*=percentage, *M*=mean, *SD*=Standard Deviation

The study consists of five universities with the frequency *f*=51, 39, 38, 57, 18 and their percentage was 25.1%, 19.2%, 18.7%, 28.1%, 8.9%. The year of study included as 7th, and 8th semesters with the frequency *f*= 33, 170 and their percentage was 16.3%, 83.7%. The age consists of 20 to 24 with (*M=21.96, f=.961).* the gender consisted of 39 males and 164 females with percentages of 16.3% and 83.7%. The marital status includes 4 married and 199 unmarried with a percentage of 2%, 98%. The athletic status of participants was athletes and non-athletes with *f=25, 178* and their percentage was 12.3%, 87.7%. The status of profession was employed and unemployed with *f*= 14, 189 and their percentage was 6.9%, 93.1% as shown in Table 1.

Table 2
Knowledge of performance enhancing substances

Substance	Agree	Disagree	Not sure
Amino acids (AAs)			
Anabolic (masculine)	66.0	23.6	10.3
Diuretics	28.6	37.4	34.0
Energy drinks	73.4	22.7	3.9
Growth Hormone	68.5	23.6	7.9
Narcotics	36.9	42.4	20.7
Stimulants such as (amphetamine)	60.6	22.7	16.7
Vitamins	68.0	19.7	12.3
Beta-blockers	37.4	25.1	37.4
Caffeine	41.4	46.8	11.8
Cocaine	39.9	44.8	15.3

Students' responses on their comprehension of doping are displayed in Table 2. Participants' knowledge about doping in sports was measured by questioning them to show how they acknowledged the idea of doping drugs. The evolution of the knowledge of permitted substances among biochemistry students showed that the majority of the participants thought that prohibited substances such as, hormones, stimulants, and even vitamins were doping agents. These substances are included in the prohibited list. Also, (96.1%) of respondents show that energy drinks as a prohibited substance, while energy drinks are not included in the prohibited list. In this area, 66% of students maintain that diuretics are not doping agents, while these are included in banned substances. In addition, approximately (60%) of the students believed that cocaine is not a prohibited drug, while cocaine is forbidden in WADA's list. In particular, Narcotics are considered banned substances while 63% of the respondents thought that Narcotics are not considered prohibited. Also (37%) of students anticipated that beta-blockers were doping agents, but the remaining (62.5%) of participants were not aware that beta-blockers are banned substances. Caffeine is not on the prohibited list so Approximately 53% of the participants consider it as a prohibited substance.

Table 3
Objective behind administering using prohibited substances

The objective of using doping agents	SDA	DA	N	A	SA
Develop a well-toned physique	13.8%	15.3%	17.7%	43.8%	9.4%
Improve performance	11.3%	9.9%	19.2%	43.8%	15.8%

To achieve physical abilities	7.4%	14.3%	27.6%	36.9%	13.8%
Dopers as a model	16.3%	27.1%	39.9%	14.3%	2.5%

According to a statistical study presented in Table3, 79% of biochemistry students agree that improving performance in competitions is the most significant reason for using drugs, 77% of students responded that taking doping drugs was a simple way to improve their physical ability, and 61% of students agree that the use of doping is for building powerful muscles. A large percentage of students showed support for muscle development to enhance their performance by using drugs. Furthermore, 56% of respondents said that they used dopers as a model. Thus, it was found that the second (61%) and last (56%) preferences for using drugs in sports were building a powerful muscle and following dopers respectively.

Table 4
Level of Agreement or Disagreement

	SDA	DA	N	A	SA
I respect dopers.	16.7%	36%	28.6%	16.3%	2.5%
negatively affect the health of dopers.	6.4%	18.2%	20.7%	43.3%	11.3%
Doping substances is an ethically valid deed	26.1%	28.6%	18.6%	23.2%	3.9%
few days is not injurious to health	7.9%	25.1%	34.5%	29.1%	3.4%

Regarding attitudes towards the use of illegal substances, approximately 67% did not know whether using a drug for only a few days would be harmful to their health and 45% of students believed that taking a doping substance might not harm a doper's health. Also 45%% of students agree that using a performance-enhancing drug is an ethically right thing to do. Among the respondents, 47% of the participants show respect for dopers. A detailed overview is presented in Table 4.

Table 5
Participants' perspectives on Anti-doping stances

	SDA	DA	N	A	SA
In future, I might consider using banned substances	30.5%	30%	16.3%	17.7%	5.4%
I find satisfaction in counseling others against doping	3.4%	5.9%	24.1%	44.3%	22.2%
Spreading information about the adverse health effects associated with doping substances can play a pivotal role in reducing doping practices	2.0%	7.4%	19.2%	25.6%	.5%
		Yes		NO	
Have you ever used any doping substance even if it was once?		9.4%		90.6%	

In terms of student anti-doping way of behavior and the significance of enhancing awareness about the imperative to combat doping practices, the study revealed that (39%) tended to use illegal drugs in the future. In contrast, only 33% of the respondents were likely to advise others to abstain from illegal drug use. In addition, Table 5 also presents a substantial number of participants (28%) strongly disagreed with the statement that increasing awareness of the harmful consequences of doping may help reduce the prevalence of doping procedures. Hence a very small percentage of students believe that raising awareness of negative effects will not help to stop doping. Moreover, about 9.4% of the respondents say that they have used doping substances

In this section, according to the analysis as presented in Table 6, the opinion of respondents shows the most powerful factor that encourages banned substances the main factor is media. Around (66%) of media promotes banned substances. The second main factor after media is coaches, who play an important role in promoting these substances (11.3%) then on the 3rd was friends (9.9) on 4th (sports man's). and a few respondents thought for others that included their self-starters.

Table 6
Personal opinion

	Media	Friends	coach	Sports mate	Else
I think the most powerful factor that encourages using banned performance-enhancing substances is?	61.6%	9.9%	11.3%	9.4%	7.9%

Discussion

The present study sought to investigate the knowledge, awareness and attitudes of the biochemistry students towards doping in sports and their knowledge about prohibited substances. The findings demonstrated a considerable percentage of participants are familiar with anabolic steroids, hormones and stimulants due to their biochemistry background. However, there were notable misconceptions as a significant proportion of participants failed to identify substances such as stimulants, anabolic steroids, vitamins and hormones as prohibited. These outcomes suggest that most of the students of biochemistry might lack clarity regarding the substances that are strictly banned by anti-doping agencies like (WADA).

The underlying cause behind this outcome likely stems from the lack of exposure to accurate information or the presence of misconceptions on this issue. For instance, a significant proportion (96.1%) identified energy drinks as a banned substance, even though they are not listed as illegal. Similarly, a considerable ratio of students (66%) believed that diuretics are legal despite their inclusion in the prohibited substances list. A study conducted on the pharmacy students in Syria also indicated that due to lack of understanding and knowledge, most of these students failed to recognize diuretics as banned doping agents (Mazen El-Hammadi & Bashar Hunien, 2013). On the other hand, another study conducted on Omani athletes also indicated that more than half of the athletes were unaware of what doping or prohibited substances were (Nasr, Al-Yaaribi, Al Hinai, & Al-Droushi, 2023). Therefore, there is an urgent need of enhanced education on this particular subject to tackle this aspect of illiteracy regarding doping.

The study also indicated that the perspective of these students regarding the utilization of prohibited substances was influenced by several factors. It was observed that the urge of enhancing competition performance was one of the primary motives behind using prohibited substances among higher percentage of participants. Similar to this result, a study conducted in Kenya on the students of physical education and sports sciences also indicated that due to higher desire of increasing sports performance during competition, students were eager to use these prohibited substances (Rintaugu & Mwangi, 2021). Another study conducted on medical students of Egyptian university also stated that the impulsive attitude of students to win a competition at any cost was one the reasons of their positive attitude towards the use of banned substances (Badr el Dine & Attia, 2022). This attitude emphasizes the significance of promoting fair play among the overall population.

Moreover, in this regard, media turned out to be another substantial factor in promoting the utilization of prohibited substances. Around (66%) of the participants acknowledged that they had been persuaded by several media channels to consider using prohibited substances. In a parallel vein, a study carried out on pharmacy students of Pakistan proposed that media might be among the most influential factors contributing to the prevalence of doping (Ali et al., 2016). This finding underscores the need for responsible reporting and educational initiatives in the media to counteract the inadvertent normalization of doping.

Additionally, it is noteworthy that a substantial magnitude (45%) of participants regarded the use of performance enhancing substances as ethically justified. Previously, a study conducted in Switzerland also affirmed that people with lower moral or ethical values exhibited a higher incidence of prohibited substances (Ntoumanis, Ng, Barkoukis, & Backhouse, 2014). Hence, students who hold a perception that certain substances are not prohibited may be inclined to adopt a more lenient stance towards their utilization in sports. However, the integration of ethical implications and regulations of doping in the curriculum of biochemistry, could play a pivotal role in bridging these knowledge gaps and enhance critical thinking in the relevant field.

Conclusion

In conclusion, this study sheds light on complicated landscape of biochemistry students' knowledge, attitude and perceptions regarding doping in sports. These results emphasize the significance of targeted educational interventions aimed at rectifying misconceptions and promoting ethical principles. Furthermore, the influence exerted by coaches, peers and media in building students' perspectives underscores the necessity for comprehensive awareness campaigns that engage multiple stakeholders. By addressing these factors, the sports community can collaborate in promoting clean competition and uphold the clean tenets of integrity in sports.

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