Doping in sport in Uzbekistan: problems, causes, and solutions

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Abstract

This article examines the growing issue of doping in sport in Uzbekistan within the context of rapid national sports development and increasing international competitiveness. It highlights how state-led reforms, enhanced infrastructure, and strong incentive systems have contributed to significant athletic achievements, while simultaneously intensifying performance pressure on athletes.

The study identifies doping as a multifaceted problem driven by both systemic and individual factors, including high expectations for success, insufficient anti-doping education, inadequate medical supervision, and the influence of coaches or support personnel. Statistical analysis of 2021-2024 data reveals that the majority of violations involve anabolic agents (48.5%), followed by hormone modulators and diuretics, indicating a pattern of misuse of accessible pharmacological substances.

The article further explores common athlete errors, such as unsupervised medication use and lack of awareness regarding prohibited substances and Therapeutic Use Exemptions (TUEs). It emphasizes the serious health consequences associated with doping, including cardiovascular, endocrine, and psychological risks, framing doping not only as a regulatory violation but also as a public health concern.

To address these challenges, the authors propose a comprehensive prevention strategy centered on education, stricter medical oversight, institutional strengthening of anti-doping agencies, and increased accountability for all stakeholders. The study concludes that sustainable sports development in Uzbekistan depends on fostering a culture of clean sport grounded in ethics, awareness, and compliance with international anti-doping standards.

Keywords: Doping, education, prohibited substances, anti-doping rule violations, TUE

Introduction

In recent years, the development of the sports sector in Uzbekistan has become one of the key priorities of national development. Sport serves not only as a means of fostering a physically healthy generation, but also as an important factor in enhancing the prestige of the state and strengthening the country's image in the international arena. Accordingly, the Government of Uzbekistan has been implementing systematic measures aimed at the comprehensive development of sport, providing broad support to athletes, and promoting a healthy lifestyle among the population.

These large-scale reforms have yielded tangible results and contributed to significant achievements in national sport. In particular, Uzbek athletes demonstrated outstanding performance at the 2024 Olympic Games in Paris, finishing 13th overall with 8 gold, 2 silver, and 3 bronze medals. Similarly, at the 2024 Paralympic Games, Uzbekistan ranked 13th overall, winning 10 gold, 9 silver, and 7 bronze medals. In addition, at the 19th Asian Games held in 2023, Uzbek athletes secured a total of 71 medals, including 22 gold, 18 silver, and 31 bronze medals – an unprecedented result in the history of Uzbek sport.

Methods

This study employs a retrospective analytical design based on secondary data sources related to anti-doping activities. The research utilizes statistical datasets derived from World Anti-Doping Agency (WADA) reports for the period 2022–2024 [1-3], in conjunction with the data of the National Anti-Doping Agency of Uzbekistan (UzNADA).

A structured data aggregation approach was applied to compile and harmonize information from these sources. The collected data were subsequently examined using a descriptive and comparative analytical framework to evaluate the prevalence and distribution of doping cases. A classification framework, based on the WADA Prohibited List, was employed to categorize detected substances and to systematize anti-doping rule violations.

This methodological approach enabled the identification of key patterns, trends, and substance-specific distributions in positive doping cases, as well as the assessment of underlying characteristics of anti-doping violations within both national and international contexts.

Results and discussion

The analysis of anti-doping data for the period 2021–2024 identified a total of 33 anti-doping rule violations among Uzbek athletes.

These findings indicate the continued presence of doping cases within the national sports system, particularly in the context of increasing competitiveness and performance expectations.

The distribution of detected prohibited substances demonstrates a clear predominance of specific pharmacological categories. Substances classified under group S1 (anabolic agents) accounted for the largest proportion of violations, comprising 16 cases (48.5%). This category included various anabolic-androgenic steroids, reflecting a pattern of use primarily associated with performance enhancement. The second most frequently identified group was S4 (hormone and metabolic modulators), with 10 cases, of which meldonium (7 cases) and clomiphene (3 cases) were the most common substances. Group S5 (diuretics and masking agents) accounted for 6 cases, predominantly involving furosemide and canrenone. A single case involved a substance from group S2 (peptide hormones and growth factors), specifically erythropoietin.

The observed patterns suggest that doping practices are largely associated with the misuse of pharmacological substances that are relatively accessible, including medications available through legal channels. Both intentional and unintentional violations were evident, indicating gaps in knowledge and compliance with anti-doping regulations.

Analysis of contributing factors revealed that high performance pressure, combined with strong incentive structures, plays a significant role in shaping athlete behavior. In addition, insufficient awareness of anti-doping rules, limited understanding of the TUE system, and inadequate medical supervision were identified as key determinants of violations. In some instances, improper guidance from coaches or medical personnel further contributed to non-compliance.

Common errors among athletes included the unsupervised use of medications, failure to verify substances against the WADA Prohibited List [4], and a lack of understanding regarding the classification of prohibited substances. These shortcomings highlight systemic deficiencies in education and regulatory adherence.

From a medical perspective, the distribution of substance classes is associated with substantial health risks. The use of anabolic agents is linked to cardiovascular, hepatic, endocrine, and psychological complications. Hormone and metabolic modulators may disrupt endocrine balance and metabolic processes, while diuretics pose risks of dehydration, electrolyte imbalance, and renal dysfunction. The use of erythropoietin carries significant risks related to increased blood viscosity and thromboembolic events.

Development of Sport in Uzbekistan. Under the leadership of President Shavkat Mirziyoyev, the development of sport has been elevated to a key priority of state policy in the Republic of Uzbekistan. In recent years, a comprehensive legal and regulatory framework has been established to support systemic reforms in the field of physical culture and sport.

In particular, the updated Law of the Republic of Uzbekistan *"On Physical Culture and Sports"*, adopted on March 24, 2026, provides a modernized legal basis for the governance and development of the sector. This legislative framework is complemented by a series of presidential and governmental acts, including: the Presidential Decree No. 5924 dated January 24, 2020, *"On measures to further improve and popularize physical culture and sports in the Republic of Uzbekistan"*; Presidential Resolution No. 4877 dated November 3, 2020, "*On measures to improve the personnel training system and increase scientific potential in the field of physical culture and sports*"; Presidential Resolution No. 5279 dated November 5, 2021, "*On measures to further improve the quality of reserve athlete training in Olympic and Paralympic sports through fundamental reform of the sports education system*.

The implementation of these regulatory legal acts has resulted in significant infrastructural and institutional advancements. Modern sports facilities have been constructed across all regions of the country, while children's and youth sports schools, as well as Olympic training centers, have undergone substantial modernization. In parallel, the system of athlete preparation for international competitions has been strengthened, accompanied by enhanced social, financial, and moral support mechanisms for athletes.

The Government of Uzbekistan also provides substantial incentives for high-performance outcomes. Athletes who achieve success at major international competitions, including the Olympic and Paralympic Games, as well as World and Asian Championships, are recognized through prestigious state awards and financial rewards. While these measures contribute positively to the development of elite

Table 1. Statistics of doping cases and prohibited substances detected among Uzbek athletes (2021–2024)

Group of prohibited substances	Total number	Prohibited substances and their number	Prohibition class
S1. Anabolic agents	16	Testosterone and their analogs – 5; Methasterone – 3; Oxandrolone – 2; Drostanolone – 2; Boldenone – 1; Methandienone – 1; Trenbolone – 1; Clenbuterol – 1;	Non-specific*
S4. Hormone and metabolic modulators	10	Meldonium – 7; Clomiphene – 3.	Meldonium – non-specific; Clomiphene – Specific**
S5. Diuretics and masking agents	6	Furosemide – 5; Canrenone - 1	Specific
S2. Peptide hormones, growth factors, related substances, and mimetics	1	Erythropoietin – 1.	Non-specific

sport and international competitiveness, they may also unintentionally intensify performance pressure.

From a scientific and anti-doping perspective, the increasing competitiveness of sport, combined with strong performance incentives, can contribute to the emergence of a "win-at-all-costs" mentality among some athletes. This, in turn, may elevate the risk of anti-doping rule violations, including the use of prohibited substances for artificial performance enhancement, rapid weight reduction, or the masking of doping practices. Such dynamics underscore the importance of strengthening preventive anti-doping education, ethical standards in coaching and medical support, and effective regulatory oversight within the national sports system.

Problems of Doping and Its Root Causes. Despite the extensive reforms undertaken and the favorable conditions created by the state, serious challenges remain in the field of sport. One of the most dangerous and complex issues is the problem of doping. Scientific research and international experience indicate that as the level and intensity of sports development increase in any country, the risks associated with doping become more multifaceted and difficult to control.

In Uzbekistan, a gradual increase in doping cases among athletes has also been observed, as confirmed by statistical data. This situation is linked not only to insufficient personal responsibility or limited medical knowledge among athletes, but also to deeper underlying factors. These include excessive pressure to achieve highly competitive results, inappropriate guidance from coaches or medical personnel, inadequate effectiveness of medical supervision, insufficient education on anti-doping rules, and concerns related to career advancement.

Between 2021 and 2024, the National Anti-Doping Agency of Uzbekistan identified positive doping test results in a total of 33 athletes (Table 1). Among these cases, 16 athletes (48.5%) tested positive for substances classified under group S1 (anabolic agents), which represents the largest proportion of detected violations. Nearly all substances in this group are strictly prohibited, and their use entails anti-doping rule violations regardless of whether the intake was intentional or unintentional.

Following anabolic agents, substances

belonging to group S4 (hormones and metabolic modulators) accounted for the second largest number of cases, with 10 detections. Within this group, meldonium was the most frequently identified substance (7 cases) (Table 1). Since meldonium is not an analgesic, its use constitutes an anti-doping rule violation in all circumstances. Another substance, clomiphene (3 cases), is classified as a specified substance and may be used legitimately under certain medical conditions with a Therapeutic Use Exemption (TUE). Nevertheless, in practice, cases persist in which athletes use this substance arbitrarily, either due to a lack of understanding or insufficient awareness of its prohibited status.

Substances from group S5 (diuretics and masking agents) constituted the third most frequently detected category, with 6 cases identified. The most common substances in this group were diuretics such as furosemide (5 cases) and canrenone (1 case). These substances are primarily used to reduce body fluid levels or to mask the presence of other prohibited substances. Although they are classified as specified substances, their use without prior approval, even in the presence of medical indications, is considered an anti-doping rule violation.

In one case, erythropoietin (EPO), a substance belonging to group S2 (peptide hormones and growth factors), was detected. Although detections of substances from this class are relatively rare, such violations are regarded as particularly serious under anti-doping regulations. EPO has limited medical applications and may only be used under strictly controlled conditions; even then, its use requires special authorization. The detection of this substance therefore represents a significant breach of anti-doping rules (Table 1).

An analysis of the above table demonstrates that the doping cases identified among Uzbek athletes are primarily associated with several major classes of prohibited substances. A significant proportion of these cases involve the misuse of medicines that are freely or relatively easily available in pharmacies. This indicates that, in genuine medical situations, athletes could receive treatment legally. However, in many instances, the arbitrary use of such medications, due to a lack of awareness or insufficient seriousness regarding anti-doping rules, results in severe consequences for athletes.

Main mistakes made by athletes. An analysis of the data reveals that the following mistakes are most commonly observed among athletes:

Arbitrary use of medications purchased from pharmacies without consultation with a qualified physician;

Lack of understanding of the distinction between specified and non-specified prohibited substances;

Insufficient awareness of, or disregard for, the Therapeutic Use Exemption (TUE) process;

Failure to verify the composition of medications and their status on the Prohibited List.

Uncontrolled use of medications not only undermines athletic performance, but also damages the professional activity and reputation of athletes. Doping violations may result in disqualification, forfeiture of medals, financial sanctions, and significant psychological stress.

Medical Consequences of Prohibited Substances Identified in Uzbek Athletes (2021-2024)

The analysis of doping cases presented in *Table 1* not only reflects the distribution of anti-doping rule violations among Uzbek athletes, but also highlights substantial health risks associated with the detected classes of prohibited substances under the World Anti-Doping Agency (WADA) Prohibited List. A class-based medical interpretation of these findings provides important insight into the potential short- and long-term consequences for athlete health.

As shown in Table 1, substances classified under *group S1 (anabolic agents)* accounted for the largest proportion of violations (48.5%). This finding is particularly concerning from a clinical perspective, as anabolic-androgenic steroids are strongly associated with multisystem pathology. Cardiovascular risks include hypertension, dyslipidemia, characterized by decreased *high-density lipoprotein* (HDL) or “good cholesterol” and increased *low-density lipoprotein* (LDL) or “bad” cholesterol, accelerated atherosclerosis, and an elevated likelihood of myocardial infarction and stroke [5,6]. In addition, hepatotoxic effects, ranging from liver enzyme abnormalities to hepatic tumors, are well documented. Endocrine disruption is another major consequence, including suppression of endogenous testosterone production, infertility, and gonadal dysfunction. Psychiatric manifestations, such as aggression, mood instability, and dependency, further compound the health burden associated with this class of substances.

The second most frequently detected category in Table 1 is *group S4 (hormone and meta-*

bolic modulators), with particular prevalence of Meldonium and Clomiphene. The misuse of these substances may lead to significant endocrine and metabolic disturbances. Meldonium, which alters myocardial energy metabolism, may contribute to cardiovascular dysregulation, although its long-term effects in healthy athletes remain insufficiently studied [7]. Clomiphene interferes with the hypothalamic-pituitary-gonadal axis, potentially causing hormonal imbalance, visual disturbances, mood disorders, and an increased risk of thromboembolic complications. The presence of these substances in multiple cases suggests a pattern of unsupervised or inadequately informed use, which increases the likelihood of adverse outcomes.

Group S5 (diuretics and masking agents) represents the third most common category identified in Table 1, primarily involving Furosemide and Canrenone. From a medical standpoint, the misuse of diuretics is associated with acute and potentially life-threatening complications. These include severe dehydration, hypovolemia, and electrolyte imbalances, particularly hypokalemia and hyponatremia, which can precipitate cardiac arrhythmias and neuromuscular dysfunction [8]. Furthermore, excessive fluid loss may result in acute kidney injury, reduced exercise capacity, and increased susceptibility to heat-related illnesses, especially in sports requiring rapid weight reduction.

Although less frequent, the detection of a substance from *group S2 (peptide hormones and growth factors),* specifically Erythropoietin (EPO), represents a particularly serious medical and regulatory concern. EPO misuse increases red blood cell mass and blood viscosity, significantly elevating the risk of thromboembolic events such as deep vein thrombosis, stroke, and myocardial infarction [9]. Additional complications include hypertension and an increased risk of sudden cardiac death, especially under conditions of dehydration or intense physical exertion.

Taken together, the distribution of substances identified in Table 1 demonstrates that the most prevalent anti-doping rule violations in Uzbekistan are associated with pharmacological classes carrying substantial health risks. These findings underscore that doping is not solely a matter of regulatory non-compliance but also a critical public health issue. The observed patterns highlight the need for strengthened preventive strategies, including targeted education, improved medical supervision, and enhanced awareness of the physiological consequences of prohibited substance use.

Consequences of Improper Use of Prohibited Substances and Preventive Strategies

The uncontrolled or inappropriate use of pharmacological substances, particularly those included in the Prohibited List of the World Anti-Doping Agency (WADA), poses significant risks not only to athletes' health but also to their sporting careers and professional reputation. Violations of anti-doping rules may result in disqualification, annulment of results, forfeiture of medals and titles, financial sanctions, and periods of ineligibility. In addition to these formal consequences, athletes often experience substantial psychological stress, reputational damage, and long-term career disruption.

To minimize the risk of such outcomes, several fundamental preventive principles should be consistently observed. First, athletes should consult qualified sports physicians or anti-doping specialists prior to using any medication or supplement. Second, the status of all substances must be verified against the current WADA Prohibited List before use. Third, where medically justified, athletes must be familiar with and adhere to the procedures for obtaining a Therapeutic Use Exemption (TUE). Fourth, systematic anti-doping education and awareness programs should be implemented for athletes, coaches, and medical personnel. Finally, the principle of strict liability, under which "ignorance does not exempt from responsibility", must be clearly communicated and understood at all levels of sport.

Primary Causes of Anti-Doping Rule Violations among Uzbek Athletes. According to the WADA Code, doping encompasses a broad spectrum of conduct and is not limited to the intentional use of prohibited substances. It includes 11 categories of anti-doping rule violations, such as the use or attempted use of prohibited substances or methods, evasion of testing, possession, trafficking, administration, and failures in whereabouts information [10]. Within the context of Uzbekistan, the principal contributing factors to such violations can be grouped as follows:

1. High performance incentives. Substantial financial rewards [11] and state recognition for successful athletes may inadvertently create pressure to achieve results at any cost, thereby increasing susceptibility to doping practices.

2. Popularity and social pressure. Success at major international competitions, such as the

Olympic Games or World Championships, brings national recognition and media attention [12, 13], but also imposes considerable psychological pressure and expectations.

3. Limited awareness of the TUE system. Some athletes and coaches lack sufficient understanding of the Therapeutic Use Exemption mechanism [14], or fail to utilize it appropriately for legitimate medical treatment.

4. Insufficient anti-doping education. Inadequate knowledge regarding the health risks of doping, applicable sanctions, and ethical standards contributes significantly to unintentional violations.

5. Irresponsibility or misconduct of support personnel. In certain cases, coaches or medical staff may recommend or facilitate the use of prohibited substances, either due to negligence or disregard for anti-doping regulations.

Strategies for the Prevention of Doping Violations. Effective prevention of doping requires a comprehensive and multidisciplinary approach addressing the underlying risk factors identified above.

Strengthening anti-doping education. The introduction of mandatory educational programs for athletes, coaches, physicians, and sports administrators is essential. The Uzbekistan National Anti-Doping Agency has implemented a range of scientific and practical initiatives, including seminars, training sessions, and workshops for stakeholders across sports federations, youth sports schools, and Olympic and Paralympic training institutions. These programs enhance knowledge of the health risks associated with doping, the requirements of the WADA Code, proper use of the TUE system, and the ethical principles of sport.

Promotion of clean sport values through mass media. Public awareness campaigns play a crucial role in shaping attitudes toward doping. The dissemination of educational content through television, social media, and sporting events, under initiatives such as “Doping-free sport is honest sport”, can strengthen collaboration among athletes, families, media, and public institutions. Importantly, anti-doping efforts must extend beyond testing and sanctions to include education, communication, and the cultivation of a culture of integrity in sport.

Institutional strengthening of the National Anti-Doping Agency. Enhancing the authority and operational capacity of the national anti-doping organization is critical. This includes ensuring unrestricted access for doping control officers to sports facilities and athlete locations, thereby improving the effectiveness of testing and monitoring systems.

Promotion of the Therapeutic Use Exemption system. Regular dissemination of information regarding TUE procedures, including the use of digital application platforms, is necessary to ensure that athletes can access legitimate medical treatment without violating anti-doping rules.

Strengthening accountability mechanisms. In addition to athletes, coaches and medical personnel involved in doping-related violations must be held accountable in accordance with applicable regulations, thereby reinforcing a culture of responsibility across the athlete support network.

*Expansion of international cooperation***.** Collaboration with international organizations, including the World Anti-Doping Agency and Regional Anti-Doping Organizations (RADOs), facilitates the exchange of expertise, implementation of joint educational initiatives, and adoption of best practices in anti-doping policy and enforcement.

Conclusion

The issue of doping in sport extends beyond its impact on athletic performance and represents a broader challenge to public health, ethical standards, and the integrity of sport. It is therefore essential that all stakeholders – athletes, coaches, medical personnel, and sports organizations – adhere strictly to the principles of clean sport as established by the World Anti-Doping Agency.

The promotion of a doping-free sporting environment is a critical prerequisite for fostering a healthy generation and ensuring the fair representation of the Uzbekistan on the international stage. The development of sport based on integrity, transparency, and respect for rules contributes not only to national sporting success but also to the reputation and long-term well-being of individual athletes.

As demonstrated throughout this study, the sports sector in Uzbekistan has been elevated to a priority area of state policy, with substantial investments in infrastructure, education, and athlete support systems. However, sustainable progress in elite sport must be grounded in ethical conduct, responsibility, and adherence to anti-doping regulations.

Importantly, the available evidence indicates that a significant proportion of anti-doping

rule violations are associated not with intentional misconduct, but with insufficient awareness, inadequate medical guidance, and the improper use of medications and supplements. This finding underscores the critical importance of preventive strategies, including comprehensive education, continuous awareness-raising, and strengthened medical supervision.

In conclusion, the systematic and coordinated implementation of these measures will enhance athletes' knowledge, improve early detection and risk prevention mechanisms, and support the establishment of a sustainable sporting environment based on the principles of fairness, health, and integrity.

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