

Doping Trends in Malaysian Sports: Analysis of Banned Substances Usage among Athletes

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Abstract The use of banned substances to enhance athletic performance is prohibited by most international sports federations. Despite this, athletes often resort to these substances as a shortcut to achieve their goals, such as recovering from injuries, accelerating muscle growth, boosting energy and performance, improving endurance, or losing weight. This study provides a comprehensive analysis of doping cases in Malaysian sports over 17 years, from 2005 to 2022. The data sources include reports on the suspension of Malaysian athletes, anti-doping testing figures and other published materials. The findings reveal that doping remains a persistent challenge, particularly during major sporting events such as the SEA Games, Asian Games, and Sukma Games, where doping incidents tend to spike. These trends suggest that competitive pressure may drive athletes to use performance-enhancing substances. While recent declines in cases can be linked to improved anti-doping measures, like the Athlete Biological Passport (ABP), and the impact of the COVID-19 pandemic, the resurgence of doping in 2021 and 2022 underscores that the issue persists. A higher incidence of doping among male athletes mirrors global patterns, highlighting the need for gender-specific education and prevention strategies. The study also shows that anabolic agents are the most frequently detected substances in Malaysia, followed by stimulants, diuretics, and masking agents, in line with international trends. Sports most affected by doping in Malaysia include bodybuilding, weightlifting, athletics, and cycling. These findings

reinforce the need for sustained anti-doping education, comprehensive testing, and stricter regulation enforcement to safeguard athlete health and preserve the integrity of sports. The role of Anti-Doping Agency of Malaysia (ADAMAS), alongside the broader involvement of coaches, medical professionals, and athletes, remains vital in promoting a culture of clean and fair competition in Malaysian sports.

Keywords Doping Cases, Anabolic Agents, Performance, Malaysian Athlete, Banned Substances

1. Introduction

Doping in sports involves the illegal use of banned substances and techniques to gain an unfair advantage, jeopardizing athlete health and the integrity of sporting events [1]. Substances commonly abused include stimulants, anabolic agents, diuretics, and other performance-enhancing drugs (PEDs), while illicit methods like blood and gene doping also pose significant risks [2], [3]. Athletes use these methods to achieve goals such as weight loss, muscle growth, enhanced performance, and improved recovery or endurance [4]–[6]. Regulatory bodies like the World Anti-Doping Agency (WADA) work to uphold the integrity of sports by implementing standardized anti-doping programs across international

federations [7], [8]. Addressing the persistent challenge of doping requires a comprehensive approach, including education, prevention, detection, enforcement, and rule-making, to protect athletes and promote fair competition.

Thus, it is important to investigate doping trends in Malaysia for several reasons. Firstly, by providing credibility and fairness on a national and worldwide level, it contributes to the preservation of national sports' integrity. The concept of fair competition is damaged by doping, and by being aware of its prevalence, stakeholders can take the appropriate measures to protect sports integrity. Secondly, significant health concerns are associated with several banned substances, including the possibility of hormone imbalances, cardiovascular problems, and psychological consequences [6], [9]. By identifying commonly used substances and their prevalence, health professionals and sports authorities can develop targeted programs to protect athletes. Thirdly, the study informs policy development. Data on doping trends can guide the creation and refinement of anti-doping policies and regulations, ensuring that resources are allocated effectively and interventions are designed to target specific issues. Based on the results, educational initiatives that raise awareness of the risks and repercussions of doping and encourage a culture of clean sportsmanship can be customised [10]. Finally, Malaysia's standing in the international sports world is improved by its adherence to anti-doping regulations. Pre-emptive actions grounded in comprehensive research might enhance Malaysia's adherence to agencies like the WADA.

The purpose of this article is to investigate and evaluate doping cases involving Malaysian athletes from 2005 to 2022. The study's 17-year focus allows it to offer a thorough picture of the patterns and changes in doping procedures. This period of time includes important advancements in anti-doping laws on a national and international scale, making it possible to spot trends and changes in behaviour and enforcement. The analysis is predicated on reports from published documents, the WADA, and the Anti-Doping Agency of Malaysia (ADAMAS). WADA reports give a worldwide framework and standard, whereas ADAMAS reports provide detailed information on doping cases, including the types of banned substances and the sports involved. The article uses descriptive statistics to identify trends, prevalence, and descriptive details regarding doping cases in Malaysia by combining data from these different sources, offering a thorough and reliable analysis.

2. Methodology

Data for this study were collected from both primary and secondary sources. Primary sources included official reports, such as athlete suspension lists and documents detailing banned substances from authoritative bodies like ADAMAS. Secondary sources comprised publicly available materials, including published articles, and other published reports, such as the 2022 Anti-Doping Testing Figures [11]. To ensure the reliability and accuracy of the data obtained from secondary sources, cross-referencing was conducted with official reports and databases whenever possible.

Data were electronically extracted from the Malaysian athletes' suspension list reports [12] and entered into a database specifically designed for this research. The extraction process was performed using Microsoft Excel 2019. After extraction, the total number of doping cases was calculated according to sports types, types of banned substances, and distribution by year. These data were then automatically sorted and grouped using Excel's Pivot Table functions, ensuring accurate categorization and analysis.

3. Results

Data on doping cases among Malaysian athletes were obtained from ADAMAS reports covering the period from 2005 to 2022, specifically from the athlete suspension lists. Based on Figure 1, a total of 220 doping cases were reported in Malaysia from 2005 to 2022, revealing significant fluctuations in annual distributions. The highest numbers of cases were recorded in 2011 and 2014, with 28 and 30 cases, respectively. Other notable increases occurred in 2010 (15 cases), 2013 (19 cases), and 2016 (24 cases). In contrast, recent years show a marked decrease in doping cases: 15 cases in 2018, five in 2019, zero in 2020, two in 2021, and six in 2022. Table 1 and Figure 2 summarize the Malaysian doping cases within this timeframe. According to Table 1, male athletes accounted for 175 cases, while female athletes accounted for 45 cases. Figure 2 illustrates that the most frequently detected banned substances were anabolic agents, comprising 108 cases (49%). This was followed by stimulant agents with 37 cases (16.8%), diuretics and other masking agents with 23 cases (10.5%), glucocorticoids with 21 cases (9.5%), hormone and metabolic modulators with five cases (2.3%), beta-blockers with five cases (2.3%), cannabinoids with four cases (1.8%), beta-2 agonists with four cases (1.8%), and other substances with 13 cases (5.9%).

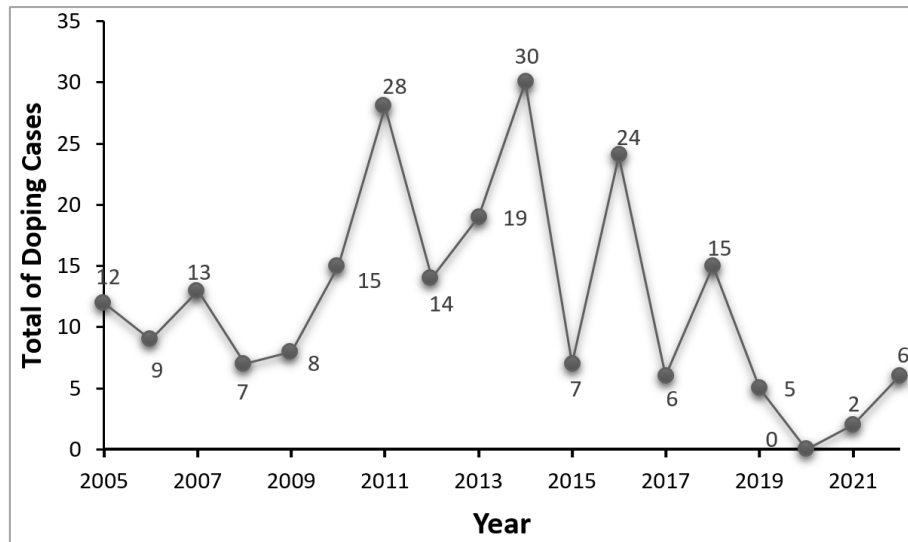
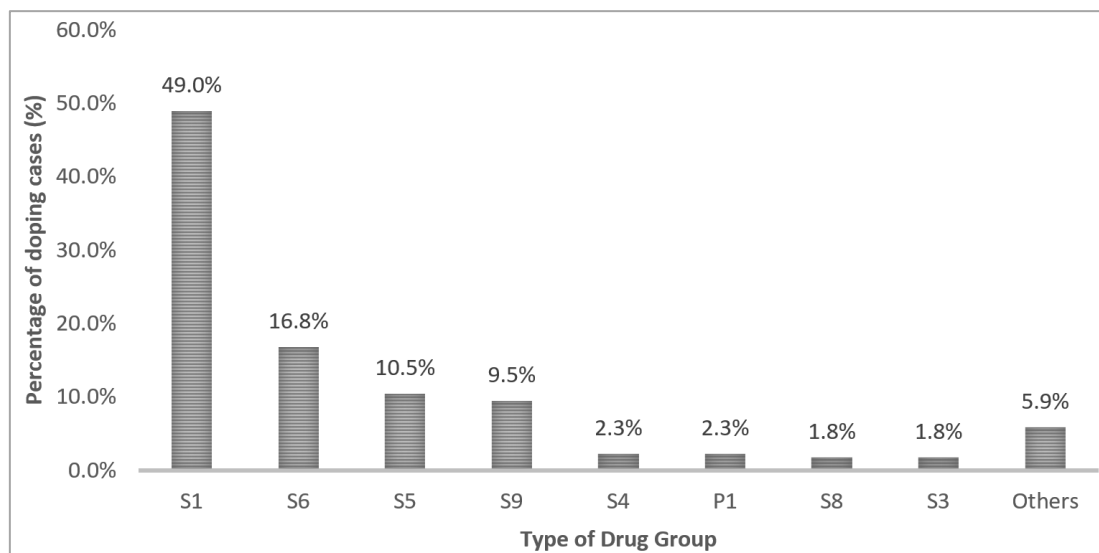


Figure 1. Annual Distribution of Doping Cases in Malaysia (2005-2022)

Table 1. Summary of Malaysian athletes doping cases between 2005 and 2022

Group Drug Class	No. of male athletes	No. of female athletes	Total of the doping cases	Percentage of the doping cases (%)
Anabolic Agents (S1)	99	9	108	49.0
Stimulants Agents (S6)	24	13	37	16.8
Diuretics and Other Masking (S5)	18	5	23	10.5
Glucocorticoids Modulators (S9)	12	9	21	9.5
Hormone and Metabolic (S4)	5	0	5	2.3
Beta-Blockers (P1)	2	3	5	2.3
Cannabinoids (S8)	4	0	4	1.8
Beta-2 Agonists (S3)	3	1	4	1.8
Others	8	5	13	5.9
Total	175	45	220	±100



Note: S1, Anabolic Agents; S6, Stimulants; S5, Diuretics and Other Masking Agents; S9, Glucocorticoids; S4, Hormone and Metabolic Modulators; P1, Beta-Blockers; S8, Cannabinoids; S3, Beta-2 Agonists.

Figure 2. Percentage of banned substances group of the doping cases in Malaysia between 2005 and 2022

Table 2. Banned substances identified in each drug class for all sports

Substances identified in each drug class	No. of athletes (n = 220)	Percentage within drug class (%)	Percentage of total doping cases (%)
Anabolic Agents (n = 108)			
Stanozolol	31	28.7	14.1
Metandienone	28	25.9	12.7
Clenbuterol	17	15.7	7.7
Drostanolone	10	9.3	4.6
Nandrolone	10	9.3	4.6
Others (oxymetholone, boldenone, boldione, metenolone, methasterone, 17,methylandrostandiol and etc.)	12	11.1	5.5
Stimulants (n = 37)			
Sibutramine	10	27.0	4.6
D-Methamphetamine	7	18.9	3.2
Methylhexaneamine	6	16.2	2.7
Phentermine	4	10.8	1.8
Others (amphetamine, ephedrine, levomethamphetamine, methamphetamine, methylenedioxyamphetamine (MDA), methylenedioxymethamphetamine (MDMA), nikethamide and etc.)	10	27.0	4.6
Diuretics and Other Masking Agents (n = 23)			
Furosemide	14	60.8	6.4
Hydrochlorothiazide	4	17.4	1.8
Others (Chlorothiazide, canrenone and dorzolamide)	5	21.7	2.3
Glucocorticoids (n = 21)			
Prednisolone	8	38.1	3.6
Prednisone	7	33.3	3.2
Others (triamcinolone acetonide, dexamethasone and etc.)	6	28.6	2.7
Hormone and Metabolic Modulators (n = 5)			
Tamoxifen	3	60.0	1.4
Letrozole	2	40.0	0.9
Beta-Blockers (n = 5)			
Propranolol	3	60.0	1.4
Atenolol	2	40.0	0.9
Cannabinoids (n = 4)			
Cannabis / marijuana / Delta-9 Carboxy-THC	4	100	1.8
Beta-2 Agonists (n = 4)			
Salbutamol / Terbutaline	4	100	1.8
Others (n = 13)			
Missed test, refused to be tested and unknown compound	13	100	5.9
Total	220	±100.00	

Table 3. Summary of doping cases in Malaysia according to sports categories

Types of Sports Categories	Group Drug Class									Total	Percentage of total doping cases (%)
	S1	S6	S5	S9	S4	P1	S8	S3	O		
Body Building	60	1	10	X	5	X	X	X	7	83	37.7
Body Building	60	1	10	X	5	X	X	X	7	83	37.7
Strength And Endurance	37	11	3	12	X	X	X	2	6	71	32.3
Athletics	6	4	1	11	X	X	X	1	6	29	13.2
Weightlifting	24	7	2	X	X	X	X	1	X	34	15.5
Cycling	7	X	X	1	X	X	X	X	X	8	3.6
Team Sports	4	15	X	3	X	X	3	1	X	26	11.8
Hockey	1	7	X	1	X	X	X	X	X	9	4.1
Netball	X	3	X	2	X	X	X	1	X	6	2.7
Football	1	4	X	X	X	X	X	X	X	5	2.3
Sepak takraw	1	1	X	X	X	X	1	X	X	3	1.4
Rugby	1	X	X	X	X	X	2	X	X	3	1.4
Combat Sports	4	3	8	1	X	X	X	X	X	16	7.3
Boxing	1	X	6	X	X	X	X	X	X	7	3.2
Taekwondo	3	X	X	X	X	X	X	X	X	3	1.4
Judo	X	X	1	1	X	X	X	X	X	2	0.9
Pencak silat	X	2	X	X	X	X	X	X	X	2	0.9
Muay Thai	X	X	1	X	X	X	X	X	X	1	0.5
Wushu	X	1	X	X	X	X	X	X	X	1	0.5
Skill Sports	X	5	1	X	X	5	1	1	X	13	5.9
Shooting	X	1	X	X	X	5	1	X	X	7	3.2
Archery	X	2	X	X	X	X	X	X	X	2	0.9
Lawn bowls	X	2	X	X	X	X	X	X	X	2	0.9
Golf	X	X	1	X	X	X	X	1	X	2	0.9
Aquatics	2	2	1	X	X	X	X	X	X	5	2.3
Diving	X	2	1	X	X	X	X	X	X	3	1.4
Swimming	2	X	X	X	X	X	X	X	X	2	0.9
Racket Sports	X	X	X	3	X	X	X	X	X	3	1.4
Squash	X	X	X	2	X	X	X	X	X	2	0.9
Badminton	X	X	X	1	X	X	X	X	X	1	0.5
Gymnastics	X	X	X	2	X	X	X	X	X	2	0.9
Gymnastics	X	X	X	2	X	X	X	X	X	2	0.9
Paralympics	1	X	X	X	X	X	X	X	X	1	0.5
Para Powerlifting	1	X	X	X	X	X	X	X	X	1	0.5
Total	108	37	23	21	5	5	4	4	13	220	±100

*Note: S1, Anabolic Agents; S6, Stimulants; S5, Diuretics and Other Masking Agents; S9, Glucocorticoids; S4, Hormone and Metabolic Modulators; P1, Beta-Blockers; S8, Cannabinoids; S3, Beta-2 Agonists; O, Others.

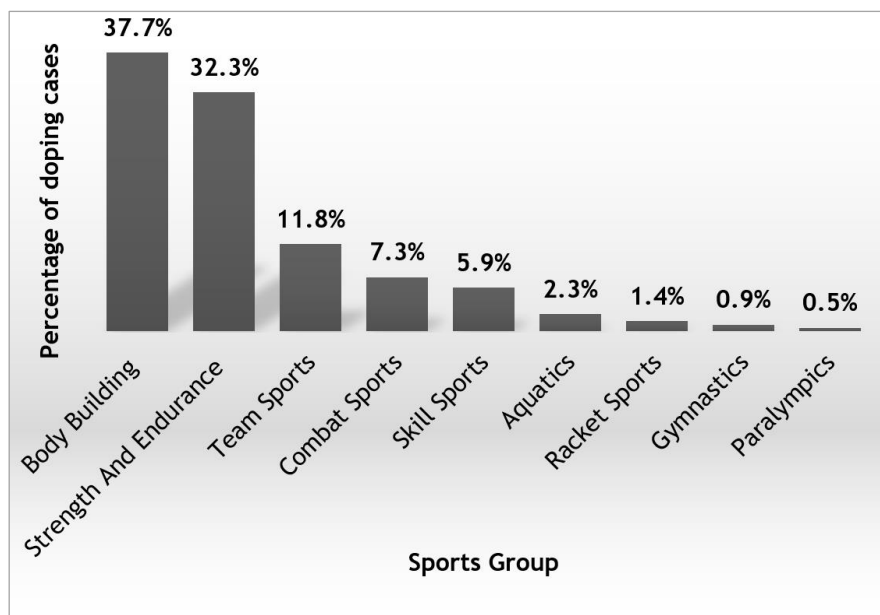


Figure 3. Percentage of doping cases in Malaysia according to different sports groups between 2005 and 2022

Table 2 displays the common banned compounds identified in doping cases across all sports among Malaysian athletes. The most frequently used anabolic agents included stanozolol, metandienone, clenbuterol, drostanolone, and nandrolone, which accounted for 10 to 31 cases (4.6% to 14.1%) of all doping cases. For stimulants, diuretics, and glucocorticoids, the most commonly banned compounds were sibutramine (10 cases, 4.6%), d-methamphetamine (seven cases, 3.2%), methylhexanamine (six cases, 2.7%), phentermine (four cases, 1.8%), furosemide (14 cases, 6.4%), hydrochlorothiazide (four cases, 1.8%), prednisolone (eight cases, 3.6%), and prednisone (seven cases, 3.2%). Additionally, hormone and metabolic modulators (tamoxifen and letrozole), beta-blockers (atenolol and propranolol), cannabinoids (cannabis/marijuana), and beta-2 agonists (salbutamol and terbutaline) contributed to the remaining positive doping cases, each ranging from 0.9% to 1.8% (two to four cases). The "others" category included 13 cases detected between 2005 and 2022, comprising unidentifiable data due to missing tests (one case), refusal to be tested (six cases), and unknown substances (six cases). This category also contributes to the total number of doping cases in Malaysia.

Table 3 and Figure 3 indicate the percentage of doping cases according to sports categories and sports types among Malaysian athletes from 2005 to 2022. According to the table, the bodybuilding sports category (83 cases, 37.7%) contributed the most to the total percentage of doping cases among Malaysian athletes, followed by the strength and endurance category (71 cases, 32.3%), the team sports category (26 cases, 11.8%), the combat sports category (16 cases, 7.3%), the skill sports category (13 cases, 5.9%), the aquatics category (five cases, 2.3%), the racket sports category (three cases, 1.4%), the gymnastics category (two

cases, 0.9%), and the paralympics category (1 case, 0.5%). The table also shows the total percentage of doping cases according to the type of sport. The total percentage of doping cases for each sport is also shown in the table; bodybuilding (83 cases, 37.7%), athletics (29 cases, 13.2%), and weightlifting (34 cases, 15.5%) accounted for the majority of doping cases, while other sports such as cycling, football, hockey, sepak takraw, rugby, netball, taekwondo, boxing, judo, muay thai, wushu, pencak silat shooting, archery, lawn bowls, golf, swimming, diving, badminton, squash, gymnastics and para powerlifting accounted between 0.5% to 4.1% (one to nine cases). Besides, the table shows the banned substances beta-blockers only found in shooting sports with five doping cases and none in other sports.

4. Discussion

Overview of Doping Cases in Malaysia

The longitudinal analysis of doping cases in Malaysia, as documented by ADAMAS, reveals a complex and variable pattern over the 17-years span from 2005 to 2022. A total of 220 doping cases, as illustrated in Figure 1, highlights the ongoing challenge of doping in Malaysian sports. The data notably shows sharp increases in doping incidents during years coinciding with major competitions. For example, 2011 recorded 28 doping cases, which aligns with the Southeast Asian (SEA) Games held in Indonesia. Similarly, 2014 saw a peak of 30 cases, corresponding with the Asian Games in Korea, while the 2016 Sukma Games (Malaysian Games) also saw a rise, with 24 reported cases. These surges can likely be attributed to the heightened competitive pressure during such events, potentially

driving some athletes to resort to prohibited substances for a performance edge. Additionally, this trend may also be linked to the lack of awareness and information about anti-doping regulations among community pharmacists and the official anti-doping agency [13]. These spikes in doping cases also can be connected to a variety of factors, including increased testing efforts, improved detection methods, or a rise in doping practices among athletes. The significant increases observed in 2010 and 2013 with 15 and 19 cases respectively, further underscore these fluctuations, which may reflect targeted testing campaigns or responses to emerging doping trends.

In recent years, there has been a notable decline in doping incidents. The number of cases fell to 15 in 2018, dropped further to five in 2019, and reached zero in 2020. Iljukov [14] attributes this decrease to the implementation of measures like the Athlete Biological Passport (ABP). Additionally, research by Bezuglov [15] indicates that new anti-doping techniques may lower performance levels by eliminating high-performing athletes who breach anti-doping rules. The absence of doping cases in 2020 can also be linked to the COVID-19 pandemic, which caused significant disruptions to sports events and doping control processes. Globally, there was also a sharp decline in doping cases, dropping from 2,702 to 1,009 as shown in Table 4, due to the reduced number of samples analyzed during the pandemic [11]. However, in 2021 and 2022, the number of doping cases in Malaysia increased to two and six cases, respectively. This trend mirrors the global pattern, where the rise in positive doping cases corresponds with the increase in samples analyzed and the resumption of regular sports activities after the pandemic.

Additionally, there is a notable gender disparity in doping cases, with 175 (80%) male athletes and 45 (20%) female athletes being sanctioned. This aligns with global trends, which show a higher involvement of male athletes in doping. For instance, a study by Mazzeo [16] reported that 78% of doped athletes were male, compared to 12% female, among Italian athletes from 2007 to 2017. This gender gap underscores a prevalent trend in doping worldwide. Understanding the timing and context of these cases can shed light on the different pressures and incentives faced by male and female athletes, highlighting the need for targeted educational and preventive measures.

Prevalent Substances Found in Malaysia and Globally

The substances most frequently used by Malaysian athletes involved in doping cases are anabolic agents, followed by stimulants, diuretics, and masking agents, mirroring global trends. On the international stage, anabolic agents consistently rank as the most commonly detected banned substances, with stimulants, diuretics, and other categories trailing closely behind. According to Table 5, data from WADA-accredited laboratories, as reported through the Anti-Doping Administration and Management System (ADAMS) across all sports, show that anabolic agents account for 42% of doping cases, stimulants for 16%, diuretics and masking agents for 15%, hormone and metabolic modulators for 11%, and cannabinoids for 5%, with other substances ranging from 0.1% to 4%. These findings are in line with WADA's 2022 global report, which includes results from all samples analyzed by its accredited laboratories.

Table 4. Comparison of years 2017 to 2022 - Olympic and Non-Olympic figures reported in ADAMS

Year	2017	2018	2019	2020	2021	2022
Sample Analyzed	245,232	263,519	278,047	149,758	241,430	256,769
Adverse Analytical Findings (AAFs)	2,749	2,774	2,702	1,009	1,560	1,986

Source: 2022 Anti-Doping Testing Figures [11].

Table 5. Summary - substances identified as AAFs in each drug class in ADAMS (all sports)

Group Drug Class	Occurrences	Percentage of all ADAMS reported findings (%)
Anabolic Agents (S1)	1124	42
Diuretics and Other Masking (S5)	419	16
Stimulants Agents (S6)	412	15
Hormone and Metabolic Modulators (S4)	288	11
Cannabinoids (S8)	134	5
Others	303	12 (0.1 – 4)
Total	2608	±100

Source: 2022 Anti-Doping Testing Figures [11].

In Malaysian doping cases, the most frequently detected banned substances include anabolic agents such as stanozolol, metandienone, clenbuterol, drostanolone, and nandrolone. Similar trends are observed in countries with high doping incidences, like Azerbaijan, Kazakhstan, and Russia. For instance, a study by Kolliari-Turner [17] highlights that metandienone is found in 38% of cases in Azerbaijan, while stanozolol is detected in 51% of cases in Kazakhstan and 52% in Russia. Bulgaria reports high frequencies of metandienone (42%) and stanozolol (45%), and Belarus and Armenia both show significant stanozolol presence (44% and 38%, respectively). Ukraine and Romania also report high rates of stanozolol (40% and 60%, respectively), while Thailand and Moldova show substantial instances of metandienone (50%) and dehydrochloromethyltestosterone (37%), respectively [18]. These international comparisons underscore the widespread issue of anabolic agents and provide context for understanding substance use patterns in Malaysia. Our study also examined the sports contributing to doping cases among Malaysian athletes, revealing that most cases involve bodybuilders, weightlifters, athletics, and cyclists, with anabolic agent use being the most prevalent. This pattern aligns with global trends observed by Geyer (2014), and similar trends are evident in countries such as Azerbaijan, Kazakhstan, and Russia, where anabolic agents are the most commonly detected substances in doping cases [18].

In Malaysia, doping cases commonly involve not only anabolic steroids but also stimulants and diuretics, reflecting global trends in countries with high doping sanctions. According to the ADAMS database, diuretics were implicated in 16% of doping cases worldwide in 2022, while stimulants accounted for 15%, making them the second and third most common doping substances after anabolic androgenic steroids (AAS). Globally, the most frequently detected diuretics were furosemide (32%), hydrochlorothiazide (17%), canrenone (11%), and dorzolamide (10%) [11]. Similarly, in Malaysia, furosemide was involved in 60.8% of diuretic-related doping cases, followed by hydrochlorothiazide at 17.4%. The remaining cases were attributed to chlorothiazide, canrenone, and dorzolamide, contributing five cases (21.7%). In Malaysia, diuretics are particularly prevalent in combat sports, with half of the doping cases in these sports involving diuretic compounds. This is likely due to their potent ability to induce rapid weight loss by removing water from the body, which is often necessary to meet weight categories in sporting events [4].

Globally, the top three stimulants contributing to doping cases across all sports in 2022 were methylphenidate (27%), amphetamine (17%), and cocaine (15%). Other notable substances, such as octodrine, 1,4-dimethylpentylamine, heptaminol, modafinil, mephentermine, dextroamphetamine, d-amphetamine, ephedrine, and phentermine, each contributed to 2-5% of doping cases worldwide [11]. However, the data from Malaysia presents

a different picture. The most common stimulants involved in doping cases were sibutramine (27%), d-methamphetamine (18.9%), methylhexanamine (16.2%), and phentermine (10.8%). Other substances, including amphetamine, ephedrine, levomethamphetamine, methamphetamine, methylenedioxyamphetamine (MDA), methylenedioxymethamphetamine (MDMA), and nikethamide, collectively made up 27% of the cases within this drug class. In Malaysia, the highest incidence of stimulant-related doping cases occurred in team sports such as hockey, netball, football, sepak takraw, and rugby, as well as in strength and endurance sports like athletics, weightlifting, and cycling, with 15 and 11 cases, respectively.

Glucocorticoids, classified as S9 by WADA, are frequently detected in doping cases worldwide. According to ADAMS data, the glucocorticoids triamcinolone acetonide, prednisolone, prednisone, dexamethasone, and betamethasone account for 30%, 21%, 19%, 14%, and 7% of cases within this drug class, respectively [11]. In Malaysia, prednisolone and prednisone are the most common, contributing to 38.1% (8 cases) and 33.3% (7 cases) of cases in this class. Other glucocorticoids, such as triamcinolone acetonide and dexamethasone, make up the remaining six cases. In Malaysia, more than half of these cases come from athletics, with 11 out of the total 21 cases involving glucocorticoids. The remaining cases are found in sports such as cycling, hockey, netball, badminton, squash, gymnastics, and judo. Glucocorticoids are widely used in clinical settings for their anti-inflammatory and immunosuppressive properties. According to Vernec [19], they are primarily used to treat musculoskeletal injuries and asthma in athletes. An analysis of therapeutic use exemptions (TUEs) reported to the International Olympic Committee (IOC) before the Olympic Games in the 1990s and early 2000s showed that 5% to 12% of elite athletes received glucocorticoids through injections, tablets, creams, eye drops, ear drops, inhalers, and nasal sprays, with inhalers being the most common. The use of glucocorticoids in sports is complex due to their widespread medical use, various preparations and administration routes, differing pharmacokinetics, potential side effects, and association with doping. It is recommended that sports associations, coaches, and others adhere to current rules to balance the risks and benefits concerning fair play and athlete health.

According to global data from 2022 [11], beta-blockers accounted for only 0.5% of doping cases worldwide. The most commonly detected substances in this class were metoprolol (36%), timolol (29%), propranolol (21%), and bisoprolol (14%). In Malaysia, beta-blocker doping cases have been even rarer, making up just 2% (five cases) over the past 17 years. These cases involved propranolol (three cases) and atenolol (two cases), all associated with shooting sports and none with other sports. Beta-blockers are medications that reduce heart rate by blocking the binding of noradrenaline, used to treat various medical

conditions. Consequently, athletes in shooting sports may use them to enhance performance by reducing postural sway during the release phase [20].

Recommendations for Improvement

Doping poses significant health risks to athletes, including cardiovascular issues, liver damage, hormonal imbalances, and psychological effects. These negative health effects highlight how crucial strict anti-doping regulations are. Doping can ruin an athlete's career and reputation in addition to harming their health. It can result in penalties, suspensions, disqualification, and loss of sponsorships, as well as damage their accomplishments and respect within the sports community [6], [9]. The whole sports community and the country's reputation suffer as well since doping scandals reduce public confidence, lower fan involvement, and foster mistrust. Furthermore, widespread doping can harm a nation's standing in international sports, casting doubt on its governing bodies and sports programmes, as well as possibly hindering its capacity to host major international competitions. Addressing doping is crucial for the health and careers of athletes and the integrity and reputation of sports overall.

The ADAMAS, which carries out robust testing to ensure compliance with the world anti-doping code and United Nations Educational, Scientific and Cultural Organization (UNESCO) International Convention against doping in sports to address doping issues in Malaysia. In order to encourage clean sportsmanship among athletes, coaches, and administrators, ADAMAS also conducts education and awareness initiatives. It is advised that comprehensive education and preventative initiatives be created, aimed at young athletes and important stakeholders such as physicians, coaches, and family members, in order to bolster these efforts. Athletes can avoid doping by having strong morals and sportsmanship instilled in them from an early age, as well as ongoing support and mentorship programmes. Malaysia can effectively combat doping and build a healthier athletic culture by cultivating an environment that promotes clean competition and supporting the creation of role models.

5. Conclusions

The longitudinal analysis of doping cases in Malaysia from 2005 to 2022 reveals a fluctuating yet persistent challenge, especially during major sporting events like the SEA Games, Asian Games and Sukma Games. These peaks in doping incidents suggest that competitive pressures may drive athletes to seek performance-enhancing substances, highlighting the need for continued vigilance and education. Although there has been a recent decline in doping cases, likely due to enhanced anti-doping measures such as the ABP and the disruptions caused by the COVID-19 pandemic, the resurgence of cases in 2021 and 2022

indicates that the issue is far from resolved. The gender disparity in doping cases, with a higher incidence among male athletes, aligns with global trends and underscores the need for targeted educational and preventive strategies that address the specific pressures faced by male and female athletes. The analysis of commonly detected substances reveals that anabolic agents remain the most prevalent in both Malaysia and globally, followed by stimulants, diuretics, and other masking agents. This pattern is consistent with international data, highlighting the widespread issue of anabolic agents in sports doping. The detailed examination of specific substances, such as stanozolol and metandienone, and their prevalence in countries with high doping incidences provides context for understanding substance use patterns in Malaysia. Furthermore, the findings reveal that doping cases in Malaysia are predominantly linked to specific sports, namely bodybuilding, weightlifting, athletics, and cycling. Overall, these findings emphasize the importance of sustained efforts in anti-doping education, rigorous testing, and the enforcement of regulations to protect the integrity of sports and the health of athletes. The role of organizations like ADAMAS remains crucial in this fight, but broader involvement from all stakeholders, including coaches, medical professionals, and the athletes themselves, is essential for fostering a culture of clean and fair competition in Malaysian sports.

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