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Brazilian footballers and the self-report of medicine intake: The show must go on

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ABSTRACT

Athletes, especially footballers, frequently use non-steroidal anti-inflammatory drugs (NSAIDs) and other medications. However, limited research on prolonged usage exists, particularly among Brazilian athletes. This study aims to investigate the prevalence of NSAIDs and analgesics in Brazilian footballers, comparing their use with that of athletes from Olympic and Paralympic sports, considering sex, competition period (in or out-of-competition), and sport type (contact or non-contact). An observational study analyzed 8,997 Doping Control Forms from 2021 and 2022, managed by the Brazilian National Anti-Doping Organization. Data such as sport, sex, collection period, and self-reported medication use in the preceding week were extracted. Medications were categorized into five groups: no medication, non-selective NSAIDs, selective NSAIDs (Cox-2), analgesics/myorelaxants, and paracetamol/dipyrone. χ^2 tests compared athlete groups, medication use, sex, sport, and test period at a 95% significance level. Results showed higher NSAID usage among footballers compared to Olympic and Paralympic athletes and athletes in contact and non-contact sports. In-competition periods were a significant factor, with footballers showing increased NSAID use compared to other athletes.

KEYWORDS: athletes; non-steroidal anti-inflammatory drugs; doping in sports; football; drug utilization.

INTRODUCTION

Non-steroidal anti-inflammatory drugs (NSAIDs) have been widely used in sports to relieve pain and oedema while offering better conditions for athletes' participation in training and competitions (Pedersen et al., 2022). On the other hand, besides these medications having side effects, their thoughtless and immoderate use can cause health problems and, in the long term, lead to muscle impairments, which can affect athletic performance (Lilja et al., 2018; Lundberg & Howatson, 2018).

Football is the first sport in the world in terms of the number of players and popularity (Dvorak et al., 2004) and requires high physical demands and technical skills (Dellal et al., 2012). In Brazil, the only five-time world champion, football is more than a sport; it is part of the country's culture. Players follow a strict calendar, with some teams playing more than 80 matches divided into regional, national, and international tournaments in a year (Confederação Brasileira de Futebol, 2023; Confederación Sudamericana de Fútbol, 2023). In addition, it is a contact sport and, therefore, has a high prevalence of injuries during training and matches (Ekstrand et al., 2011; Obërtinca et al., 2023).

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The use of NSAIDs among footballers is a well-documented issue. However, most published studies collected their data during short championships lasting a maximum of 30 days, such as the FIFA World Cup or other championships for both sexes (Mkumbuzi et al., 2023; Oester et al., 2019; Tscholl et al., 2015; Vaso et al., 2015). Notably, only a few studies have gathered data over an extended period, as seen in the works of Taioli (2007) or Trinks et al. (2021). As far as we know, there have not been any studies with Brazilian footballers, who have a long calendar of events per year, mainly with first- and second-division clubs.

Thus, this article aims to verify the prevalence of NSAIDs and analgesics in Brazilian football players, comparing this use with that of other athletes from Olympic and Paralympic sports, as well as considering aspects such as athletes' sex, whether the use occurred during out-of-competition or in-competition periods, and the type of sport (contact or non-contact). If there is overuse of NSAIDs in Brazilian football—an under-studied theme—this issue should be disseminated among the sports community to preserve athletes' health as well as their longevity in football.

METHODS

Study design

In order to achieve the proposed goals, in an analytical observational study, the researchers analysed all Doping Control Forms (DCFs) under the responsibility of the Brazilian National Anti-Doping Organization (Autoridade Brasileira de Controle de Dopagem [ABCD]) testing authority in 2021 and 2022. This authority holds the decision-making power regarding who, when, and how an athlete will be tested.

Procedures

The DCF is a document with five copies filled in by a Doping Control Officer (DCO) with the corresponding information of the athlete selected for doping control. Thus, the samples (urine, blood, or both) are collected and sent to be analysed by a World Anti-Doping Agency (WADA)-accredited laboratory, and at the same time, the DCO and the athlete provide information regarding the athlete's sport and discipline, such as whether the test was carried out in competition or not, the athlete's sex, the day and time of the sample collection, a self-report of the medications and supplements consumed in the last seven days prior to the sample collection, among other data. Regarding the athletes tested specifically by ABCD, all samples were analysed by the Brazilian Doping Control Laboratory (Laboratório Brasileiro de Controle de Dopagem [LBCD]), where at least one of the copies of all DCFs with the mentioned information was evaluated by the researchers.

The information regarding the sample number, sex, the date, whether it was in competition or out of competition, and the sport/discipline were extracted from the Anti-Doping Administration and Management System (ADAMS) and copied/pasted into an Excel spreadsheet. The declarations of use of medications and supplements in the last seven days reported in DCFs were transcribed into a column in the same spreadsheet by the researchers.

The copy of the DCFs used for this study did not show the name of the athlete, which prevented the researchers from identifying the owner of the sample or whether the test result was positive. Consequently, it was not possible for the researchers to establish an association between a DCF and any specific athlete, as recommended by WADA, or to determine whether the test result was positive. Finally, this study was submitted to the Ethics Committee (Plataforma Brasil - CAAE 57397122.5.0000.9433) and was approved, receiving the number 6029126. Beyond that, this study and its methods were approved by ABCD.

In the study, 8,342 DCFs were analysed from a total of 8,997 samples. DCFs related to the same athlete (594, equivalent to 6.60%) were not considered. Such cases are connected to the collection of blood and urine at the same time or when the provided urine samples presented a specific gravity below 1.005, in which case a new collection was necessary. A total of 17 samples (0.20%) were from non-Olympic or non-Paralympic sports (bodybuilding and waterskiing) and were thus not included in this study. Of the remaining 8,386 DCFs, 40 (0.44%) were unreadable because of poor handwriting or the carbon copy was too faint.

Furthermore, four DCFs (0.04%) were written in languages other than Portuguese, English, Spanish, or French, including unknown medications. All readable DCFs were included in the analysis. Thus, 8,386 DCFs met all criteria for inclusion, and from this total, 8,342 were analysed, with an error of 0.1% in a confidence interval (CI) of 0.99. To avoid possible mistranscriptions by the researchers responsible for data collection of medications and supplements, another researcher collected a statistically representative sample of the same information. After this second collection, the spreadsheets were compared, and the results were confirmed.

After that, in the first phase, all supplements were removed from the original spreadsheet so that only the medications remained. In the second phase, every medication was rewritten with all its components instead of its commercial name, according to the electronic leaflet of the Brazilian Health

Regulatory Agency (Agência Nacional de Vigilância Sanitária, 2023). In the third phase, the medications were classified into five categories as follows: (a) "0" – did not report the consumption of medication or reported medication for other medical conditions such as indigestion, depression, fungal or bacterial infection, allergies, and so on; (b) "1" – NSAIDs (non-selective); (c) "2" – NSAIDs (selective for COX-2); (d) "3" – analgesics (non-NSAIDs) or myorelaxants; and (e) "4" – acetaminophen (paracetamol) or dipyrone.

When the athletes reported using more than one medication, to maintain consistency and comparability across statistical analyses, the priority for classification followed the same order stated in the paragraph above. For instance, if the athlete reported the consumption of one non-selective NSAID and one analgesic, the athlete was classified as a non-selective NSAID consumer. Finally, the medication dosage and administration route were not considered, partly because most athletes did not report them.

Statistical analysis

After data collection, statistical analyses were conducted to compare NSAID use among footballers (male and female) and athletes from other sports and disciplines, separated into two different groups: Olympic sport athletes and Paralympic sport athletes. It is important to note that although football is an Olympic sport, footballers were separated from the Olympic sport group and analysed as a separate and independent group. Only a very small number of footballers may have been called up for the Olympic Games period, but the DCF does not allow for the identification of any specific subject in the sample. For this reason, there are no football players in the Olympic sports group.

Another classification used was based on contact. Thus, the sports classified as contact sports were basketball, boxing, football, football 5-a-side, handball, judo, taekwondo, water polo, and wrestling. All other sports were classified as non-contact sports.

The evaluation of associations between variable categories was performed through the analysis of adjusted standardised residuals following the χ^2 test. This analysis enables the identification of areas where there is a probability of excess or deficiency of occurrences relative to expected values. Favero and Belfiore (2017) indicate that adjusted standardised residuals greater than 1.96 characterise a 5% significance level for the association between two categories, allowing for understanding the dependency relationship between each pair of categories. Cramér's V was used to analyse the strength of the relationship presented. The statistical significance used for all analyses was 95%. The software used was the Statistical Package for the Social Sciences (SPSS), version 19.0

RESULTS

In total, 8,342 Doping Control Forms (DCFs) were analyzed, including 4,080 from 2021 and 4,262 from 2022. A total of 1,356 (16.4%) DCFs corresponded to female athletes, and 6,977 (83.6%) corresponded to male athletes. Footballers represented 63.2% (5,275 cases), Olympic athletes accounted for 27.1% (2,259 cases), and Paralympic athletes constituted 9.7% of the total (808 cases).

Most of the athletes reported no consumption of non-steroidal anti-inflammatory drugs (NSAIDs) (5,666 DCFs), while 1,558 declared the use of non-selective NSAIDs (NSAIDs NS), and 355 reported taking COX-2 selective NSAIDs (NSAIDs COX-2). Moreover, 186 athletes reported using muscle relaxants, and 577 declared using dipyrone or acetaminophen. Despite both of these medicines being classified as NSAIDs, they do not present a significant anti-inflammatory effect, and in addition, they produce distinct side effects. Significant differences were found among the reported use of these medicines (NSAIDs and acetaminophen/dipyrone; *Cramér's V* = 0.089, $p < .001$). Football athletes reported the use of NSAIDs (selective or non-selective) at a higher frequency than expected and a lower consumption of acetaminophen/dipyrone than expected. The two other groups reported a higher frequency of acetaminophen/dipyrone use than expected; athletes of Olympic sports showed lower use of NSAIDs than expected (see Table 1).

The results also suggest that women have a higher consumption of acetaminophen or dipyrone than men (*Cramér's V* = 0.090, $p < .001$; see Table 2).

It is important to emphasize the association between sex and the sports group (football, Olympic, or Paralympic). Football had a lower and statistically significant prevalence of female athletes, as only 2.26% of the football athletes were women. Women in the Olympic and Paralympic groups comprised 40.86 and 39.98% of all athletes, respectively (see Table 3).

Our results showed a higher frequency of non-selective NSAID use during in-competition periods and a lower frequency during out-of-competition periods for footballers only (*Cramér's V* = 0.055, $p = .003$) but not for Olympic sports (*Cramér's V* = 0.056, $p = .126$) or Paralympic sports (*Cramér's V* = 0.071, $p = .396$). Additionally, the football group showed differences in using muscle relaxants and acetaminophen/dipyrone during in-competition periods compared to out-of-competition periods (see Table 4).

Table 1. Self-declaration of medicine use according to sports group.

Sport group		None	Non-selective NSAIDs	NSAIDs selective Cox-2	Muscle relaxing	Paracetamol or dipyrone	Total	sig
Football	n % Adj Res	3,573 67.73% -0.4	1,067 20.23% 4.9	263 4.99% 4.3	111 2.10% -1.0	261 4.95% -9.3	5,275	$p < .001$ $V = 0.089$
Olympic	n % Adj Res	1,568 69.41% -1.6	363 16.07% -3.9	63 2.79% -4.0	55 2.43% -0.8	210 9.30% 5.2	2,259	
Paralympic	n % Adj Res	525 64.98% -1.9	128 15.84% -2.1	29 3.59% -1.0	20 2.48% -0.5	106 13.12% 7.3	808	
Total	n %	5,666 67.92%	1,558 18.68%	355 4.26%	186 2.23%	577 6.92%	8,342	

NSAIDs: Non-Steroidal Anti-Inflammatory Drugs; Adj Res: Adjusted Residuals; sig: significance; V: Cramer´s V.

Table 2. Self-declaration of medicine use according to sex.

Sport group		None	Non-selective NSAIDs	NSAIDs selective Cox-2	Muscle relaxing	Paracetamol or dipyrone	Total	sig
Female	n % Adj Res	859 62.93% 4.3	257 18.83% 0.0	55 4.03% -0.5	30 2.20% -0.1	164 12.01% 8.1	1,365	$p < .001$ $V = 0.090$
Male	n % Adj Res	4,807 68.90% -4.3	1,301 18.65% 0.0	300 4.30% 0.5	156 2.24% 0.1	413 5.92% -8.1	6,977	
Total	n %	5,666 67.92%	1,558 18.68%	355 4.26%	186 2.23%	577 6.92%	8,342	

NSAIDs: Non-Steroidal Anti-Inflammatory Drugs; Adj Res: Adjusted Residuals; sig: significance; V: Cramer´s V.

Table 3. Athletes' sex according to the sports groups.

Sport group		Football	Olympic Sports	Paralympic Sports	Total	sig
Female	n % Adj Res	119 2.26% -45.7	923 40.86% 36.8	323 39.98% 19.1	5,275	$p < .001$ $V = 0.500$
Male	n % Adj Res	5,156 97.74% 45.7	1,336 59.14% -36.8	485 60.02% -19.1	2,259	
Total	n %	5,275 63.23%	2,259 27.08%	808 6.74%	8,342	

NSAIDs: Non-Steroidal Anti-Inflammatory Drugs; Adj Res: Adjusted Residual; V: Cramer's V.

Higher frequencies of NSAID (selective COX-2 and non-selective) consumption were found ($p < .001$) in contact sports and lower frequencies among athletes of non-contact sports. On the other hand, non-contact sports athletes reported a higher frequency of using acetaminophen or dipyrone (*Cramér's V* = 0.104, $p < .001$; see Table 5).

Another result is the comparison of medicine consumption between sports grouped into football, contact (without footballers), and non-contact sports. The results (see Table 6) showed an association between these categories and the consumption of medicines (*Cramér's V* = .094, $p < .001$).

Finally, as several athletes used more than one medicine in a wide variety of combinations, Table 7 presents all frequencies found.

DISCUSSION

In this study, we aimed to investigate the use of nonsteroidal anti-inflammatory drugs (NSAIDs) and other related

Table 4. Self-declaration of medicine use according to sports groups and the period of sample collection (in or out-of-competition).

Sport group	Period	None	Non-selective NSAIDs	NSAIDs selective Cox-2	Muscle relaxing	Paracetamol or dipyrone	Total	sig
Football	OC	304** 75.62%	60** 14.93%	22* 5.47%	4** 1.00%	12* 2.99%	402	$p = .003$ $V = 0.055$
	IC	3,269** 67.08%	1,007** 20.66%	241* 4.95%	107** 2.20%	249* 5.11%	4,873	
Olympic	OC	611 69.75%	135 15.41%	28 3.20%	29 3.31%	73 8.33%	876	$p = .126$ $V = 0.056$
	IC	957 69.20%	228 16.49%	35 2.53%	26 1.88%	137 9.91%	1,383	
Paralympic	OC	179 63.25%	47 16.61%	9 3.18%	11 3.89%	37 13.07%	283	$p = .396$ $V = 0.071$
	IC	346 65.90%	81 15.43%	20 3.81%	9 1.71%	69 13.14%	525	
Total		5,666	1,558	355	186	577	8,342	

NSAIDs: Non-Steroidal Anti-Inflammatory Drugs; OC: out-of-competition; IC: in-competition; sig: significance; V: Cramer's V; **$p < .001$; *$p < .05$.

Table 5. Self-declaration of medicine use according to the kind of sport (non-contact or contact).

Sport group		None	Non-selective NSAIDs	NSAIDs selective Cox-2	Muscle relaxing	Paracetamol or dipyrone	Total	sig
Non-Contact	n % Adj Res	1,869 69.09 1.6	429 15.86 -4.6	82 3.03 -3.8	53 1.96 -1.2	272 10.06 7.8	2,705	$p < .001$ $V = 0.104$
Contact	n % Adj Res	3,797 67.40 -1.6	1,129 20.00 4.6	273 4.80 3.8	133 2.41 1.2	305 5.40 -7.8	5,637	
Total	n %	5,666 67.92	1,558 18.68	355 4.26	186 2.23	577 6.92	8,342	

NSAIDs: Non-Steroidal Anti-Inflammatory Drugs; Adj Res: Adjusted Residual; V: Cramer's V.

Table 6. Self-declaration of medicine use according to sports groups (Football, Contact and Non-Contact sports).

Sport group		None	Non-selective NSAIDs	NSAIDs selective Cox-2	Muscle relaxing	Paracetamol or dipyrone	Total	sig
Football	n % Adj Res	3,573 67.73% -0.5	1,067 20.23% 4.8	263 4.99% 4.3	111 2.10% -1.0	261 4.95% -9.3	5,275	$p < .001$ $V = 0.094$
Contact	n % Adj Res	224 61.90% -2.5	62 17.10% -0.8	10 2.79% -1.4	22 6.11% 5.1	44 12.20% 4.0	362	
Non-Contact	n % Adj Res	1,869 69.1% 1.6	429 15.9% -4.6	82 3.0% -3.8	53 2.0% -1.2	272 10.1% 7.8	2,705	
Total	n %	5,666 67.92%	1,558 18.68%	355 4.26%	186 2.2%	577 6.9%	8,342	

NSAIDs: Non-Steroidal Anti-Inflammatory Drugs; Adj Res: Adjusted Residual; V: Cramer's V.

medicines, such as the analgesics acetaminophen and dipyrone, as well as muscle relaxants in sports. The focus was analyzing Brazilian footballers and comparing them with other athletes grouped into different categories.

It is important to consider that all the information was collected using Doping Control Forms (DCFs), in which athletes reported all medicines and supplements taken in the seven days prior to sample collection, their sex, their sport/modality, and

Table 7. Medicines used by Brazilian athletes and self-declared on their DCFs in 2021 and 2022.

Combination of use	Number of DCFs	Percentage (%)
None	5,666	67.92
NSAIDs NS	1,056	12.66
Paracetamol or dipyrone	577	6.92
NSAIDs Cox-2 + dypirone or paracetamol	260	3.12
NSAIDs Cox-2	258	3.09
Muscle relax	161	1.93
NSAIDs Cox-2 + muscle relax	98	1.17
NSAIDs Cox-2 + NSAIDs NS + muscle relax	81	0.97
NSAIDs NS + paracetamol or dipyrone	67	0.80
NSAIDs Cox-2 + NSAIDs NS + paracetamol or dypirone	33	0.40
Muscle relax + paracetamol or dypirone	25	0.30
NSAIDs NS + muscle relax	23	0.28
NSAIDs Cox-2 + muscle relax + paracetamol or dypirone	23	0.28
All medicines	7	0.08
NSAIDs NS + muscle relax + paracetamol or dypirone	5	0.06
NSAIDs NS + NSAIDs Cox-2	2	0.02
TOTAL	8,342	100

NSAIDs: Non-steroidal anti-inflammatory drugs; NS: Non-selective.

whether the sample collection occurred in or out of competition. These variables could influence the use of certain medications.

Our findings indicate that the use of NSAIDs was more frequent among footballers than among other athletes (see Table 1). At the same time, the frequency of muscle relaxant use did not differ significantly among the sports groups (Olympic, Paralympic, and Football). However, footballers reported a lower-than-expected use of acetaminophen and dipyrone compared to athletes in the other sports groups.

Regarding acetaminophen/dipyrone consumption, this result can be explained by the sex of the athletes rather than by the sport itself, as 97.74% of the footballer sample consisted of men, and only 2.26% were women (see Table 3). When comparing medicine consumption among female athletes only (see Table 2), there was no significant difference in NSAID or muscle relaxant use between male and female athletes. This finding differs from some studies (Brewer et al., 2014; Christopher et al., 2020) but aligns with the previous study by da Silva et al. (2011). In fact, the association between sex and the consumption of analgesics and NSAIDs remains controversial, with varying results reported in the literature (Pedersen et al., 2022).

However, this pattern does not hold for acetaminophen and dipyrone, two common analgesics used in Brazil (Moreira de Barros et al., 2019). Our results showed a higher frequency of analgesic consumption among Brazilian female athletes, a trend that extends beyond the sports environment and is also observed in the general Brazilian population (da Silva Dal Pizzol et al., 2019). Biological differences, pathological conditions (e.g., menstrual cramps and migraines), social conditions, psychological factors, and various other reasons could explain this higher frequency of analgesic use among women (Packiasabapathy & Sadhasivam, 2018).

NSAIDs are among the most widely consumed drugs worldwide (Bindu et al., 2020; Conaghan, 2012; Grosser et al., 2017). They provide anti-inflammatory, analgesic, and antipyretic effects by inhibiting cyclooxygenase (COX) enzymes, thereby suppressing prostaglandin synthesis. However, this mechanism of action is also associated with significant side effects, including gastrointestinal issues, fluid retention, hepatotoxicity, cardiovascular risks (Bindu et al., 2020), and increased oxidative stress (Mazumder et al., 2016). There are two well-characterized COX isoforms: COX-1, which is constitutive and responsible for physiological functions such as gastric mucosal protection, platelet aggregation, and renal function, and COX-2, which is induced during inflammation and mediates pain and fever (Conaghan, 2012). However, COX-2 is also constitutively expressed in certain kidney cells, and both isoforms play crucial roles in vascular tone and cardiac homeostasis (Radi & Khan, 2019). The development of COX-2 selective inhibitors aimed to reduce gastrointestinal side effects but was associated with increased cardiovascular

risk, as evidenced by the withdrawal of rofecoxib from the market (Conaghan, 2012). These findings have raised concerns about the long-term use of NSAIDs, especially among individuals at higher cardiovascular risk (Grosser et al., 2017). Despite extensive clinical trials, no definitive conclusion has been reached regarding the cardiovascular safety of NSAIDs (Grosser et al., 2017; Radi & Khan, 2019).

Given these concerns, the indiscriminate use of NSAIDs remains an issue in football despite efforts by FIFA and F-MARC to address it (Dvorak & Junge, 2015). In this context, the "Keeping SCORE" approach proposed by Rosenbloom et al. (2022) appears to be a feasible and realistic strategy. It is essential to promote awareness that inflammation is a natural part of the healing and adaptation processes, particularly for athletes undergoing continuous physical training.

Another variable that may have influenced our findings is whether the sample collection occurred in or out of competition (World Anti-Doping Agency, 2021). In Brazilian football, the competition calendar is intense, typically with two matches per week, making it difficult to establish a truly "out-of-competition" period. Compared to other sports with less demanding schedules, this factor may have contributed to the observed patterns. Our analysis confirmed that in-competition periods were associated with higher NSAID consumption (see Table 4). Despite all sports having both in-competition and out-of-competition periods, only football showed a significant association between in-competition status and NSAID use.

There is clear evidence that athletes must be prepared to compete even when they are not in optimal condition. This expectation may be understandable in short tournaments, such as the FIFA World Cup, where teams reaching the semifinals must play seven matches in less than 30 days. However, maintaining this level of physical strain throughout an entire season may be detrimental to players' long-term health.

In this context, the side effects associated with NSAID use could have serious consequences for athletes. These effects extend beyond sports performance and have significant implications for athletes' long-term health. Barcelos et al. (2021) raised concerns about this issue, showing in animal models that diclofenac—an NSAID commonly prescribed to athletes—can inhibit muscle tissue adaptation to physical training, which is essential for performance improvement. Similar findings have been reported by Lilja et al. (2018), Lundberg and Howatson (2018), and Tscholl et al. (2015), emphasizing the potential negative impact of NSAID use on athletic performance.

Our results (see Table 5) indicate that contact sports athletes reported higher NSAID use than non-contact sports athletes. Because most contact sport athletes in our sample were footballers, we further categorized them into three groups: "Contact without Football," "Non-Contact," and "Football" (see Table 6). Although contact was not explicitly considered in the International Olympic Committee (IOC) consensus on injury risk (Schwellnus et al., 2016; Soligard et al., 2016), it could be an expected factor influencing NSAID use. Furthermore, a recent review focusing on football players (Aiello et al., 2023) confirmed that contact-related duels increase injury prevalence.

The co-administration of NSAIDs and muscle relaxants, as presented in Table 7, has been documented in the literature as a strategy for pain management in various conditions, such as low back pain (Casazza, 2012) and cervical radiculopathy (Childress & Becker, 2016). Similarly, acetaminophen has been used in combination with NSAIDs for pain relief in cases such as low back pain (Last & Hulbert, 2009) and dental procedures (Moore & Hersh, 2013). This combination has also been proposed as an alternative to opioid use in acute pain management. Although not free from adverse effects, it may be effective in pain relief and could play a role in reducing opioid consumption (Pergolizzi et al., 2021). On the other hand, the concomitant use of two or more NSAIDs may increase the risk of gastrointestinal adverse effects (Conaghan, 2012).

Several studies have reported injury prevalence in different Brazilian (Arliani et al., 2021; Drummond et al., 2021; Cristiano Netto et al., 2019; Margato et al., 2020) and European (Ekstrand et al., 2011) tournaments. However, there seems to be a gap between injury prevalence and NSAID/pain medication use. Injury rates reported in these studies are significantly lower than the prevalence of NSAID use observed in our study. For example, Arliani et al. (2021) documented 257 injuries in one year among all players in Brazil's first division, suggesting that if only two players (out of 22) were randomly selected for doping control, the number of NSAID users could be significantly higher than our findings suggest.

The IOC consensus statement (Hainline et al., 2017) provides multiple recommendations for the use of NSAIDs and analgesics in athletes, including the need for informed consent. Our study cannot fully address these recommendations due to its primary limitation: the inability to identify subjects or determine how often an athlete underwent doping control during the study period. However, our findings suggest that athlete vulnerability and performance demands are present in Brazilian football, potentially compromising athletes' health and the integrity of the sport. Anyway, further studies are necessary to investigate this issue deeply. However, clubs and teams must participate in coordinated research with a large sample and longitudinal analysis to perform them.

CONCLUSIONS

Despite the limitations mentioned above, we can conclude that some medicines are misused among Brazilian footballers, mainly NSAIDs, with an excess of use, mainly in-competition periods. These results could represent an extension of the athlete's vulnerability, in this case not related to prohibited substances and doping but to legal medicines. Even though this type of medication is theoretically less harmful than most of those on WADA's Prohibited List, its indiscriminate use can lead athletes to highly undesirable health conditions.

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