High prevalence of medication use in professional football tournaments including the World Cups between 2002 and 2014: a narrative review with a focus on NSAIDs

Philippe M Tscholl,1,2 Martin Vaso,3 Alexis Weber,3 Jiri Dvorak1,3

ABSTRACT

The use of medication in international football has been monitored since the 2002 FIFA World Cup. Team physicians were asked to provide information on prescribed medication 72 h prior to each match for every player. 69% of adult male players reported using medication, with more than half the players using non-steroidal anti-inflammatory drugs (NSAIDs). Up to one-third of all players used NSAIDs prior to every match, regardless of whether they took the field or not. The mean intake of medication was significantly higher during the FIFA Women’s World Cup (0.85 vs 0.77 substances per player and per match in men, p<0.001), whereas the use of NSAIDs was similar to that for men. In the Under-20 and Under-17 male competitions, the use of medication was lower as 60% of players used some kind of medication and 43% of the players used NSAIDs during the tournaments. Despite the potential side effects of medication, especially of NSAIDs in the recovery process after a sports activity, there is no evidence of decreasing intake. The reported incidence is alarming, and moreover is most probably underestimated, since self-medication by the players or treatment already prescribed by club physicians is not included in the published reports. Future studies should focus on the daily dosage, time of treatment and especially the medical indication for painkilling agents to better understand the underlying factors.

INTRODUCTION

The FIFA Medical Assessment and Research Centre (F-MARC) was the first medical governing body in international sports to systematically document the use of medication; it has done so since the 1998 FIFA World Cup. For FIFA tournaments, data are collected in connection with doping control after each match. Team physicians are asked to provide information about “any medication taken by the players or administered to them in the 72 hours preceding the match … The team doctor shall also note down, on the basis of the information at his disposal, medications and food supplements taken by the players without medical prescription”.

Other sports governing bodies such as the IOC and the International Association of Athletics Federations (IAAF) followed suit but only for athletes selected for doping control.

For this review, we present published data from 10 men’s, women’s and male adolescent FIFA World Cups1–3 (see table 1) and compare them with reports from other sports. This review, and the discussion of overmedication, should be viewed in the context of international campaigns warning against the harms of excessive medication.

The 2002, 2006, 2010 and 2014 FIFA World Cups

The mean intake of medication in male professional football is consistent for all World Cups with 0.77 substances per player and per match (see table 1). The most frequently prescribed substance group was non-steroidal anti-inflammatory drugs (NSAIDs; see figure 1), representing 36% of all substances. β-2-Agonists were reported in 44 players (1.2% of all substances, see table 2) during the four tournaments. However, since β-2-agonists are usually taken during the entire season and do not require a therapeutic use exemption anymore, a national team physician might ignore its use in some players. The use of medication over time did not change significantly, neither in the amount nor in its distribution of substance groups.

FIFA Women’s World Cup and the Under-17 and Under-18 FIFA World Championships

The reported use of medication during the 2003 and 2007 FIFA Women’s World Cup was significantly higher than in the Men’s World Cups (0.85 vs 0.77, p<0.001) and than in adolescent football players participating in Under-17 (U-17) and U-20 tournaments (0.51, p<0.001; see table 1). Contraceptive agents were not included in the analysis. Whereas the incidence of the use of NSAIDs was similar between adult male and female players, significantly fewer NSAIDs were administered to adolescent players, suggesting increased consumption with age (see table 2).

In 14.9% of female players, oral contraceptive use was reported. This is less than what was reported by Alaranta et al.10 for other team sport events (24%), and especially in speed, power and endurance events (40%).

NSAIDs and other analgesics

The NSAIDs category was the one that was most reported in every tournament (see figure 1). In total 54.5% of male players and 50.9% of female players participating in the FIFA World Cup used an NSAID at least once during the tournament; 43.3% adolescent players did so too. Hence, on average, more than seven male and female players per national team were using NSAIDs prior to every match, as were 4.5 players in U-17 and U-20 tournaments (see table 2). Ten per cent of the male
and female players were using more than one type of NSAIDs at one time, thus increasing the risk of side effects.

There was no difference in use of medication and NSAIDs, in particular between players participating in the match and substitutes who did not play at all; nor was there a correlation between injuries reported and reported use of medication. The most frequently prescribed application form was the oral route (93%). In only 7%, NSAIDs were administered topically, although percutaneous application of NSAIDs might be as efficient as oral preparation in the treatment of soft-tissue injuries.

Other analgesics (such as paracetamol (acetaminophen) and metamizol) were rarely used (5.4% of all substances), although they might be as efficient as NSAIDs in treating postexercise pain. Acetylsalicylic acid accounted for 2.8% of all painkilling agents (NSAIDs, analgesics and myorelaxants) in adolescent players as well as in 2.3% of female adults and 1.2% of male adult football players. As its anti-inflammatory and painkilling functions are weak and it carries an increased risk for traumatic haemorrhage, acetylsalicylic acid is not suitable for use in sports medicine.

Injections with local anaesthetics or corticosteroids were mostly intra-articular, followed by intramuscular applications. They were performed in almost 8% of all players participating in adult male tournaments, and in about 3% of female adults and male adolescent football players. The amount of administration seems to depend highly on the national team physician. Whereas 23 of 32 team physicians did not perform any injections for musculoskeletal symptoms during the 2014 World Cup, four players from one national team received peritendinous or intra-articular glucocorticoid injections prior to almost every match. The indication for these injections was not reported. Nevertheless, such repetitive practice during a tournament prior to each match is questionable since the long-term safety of intra-articular application may substantially worsen the injury if play is resumed immediately.

The medical team (ie, likely team physician) was an important influence as to the use of medication. As reported in the 2002 FIFA World Cup, one country reported using more than one type of NSAID per player per match throughout the tournament. Allopurinol—a gout medication reducing uric acid but thought to prevent skeletal and cardiac muscle damage—was prescribed to 40% of the players from one country during the tournament.

The high use of medication and NSAIDs in particular is not limited to international football. Similar use of medication has been reported during the Sydney Olympics in 2000, in top-level track and field athletes, triathletes and also in collegiate athletes. An unpublished review of articles published between 2003 and 2010 found that power/sprint disciplines show a similar ‘substance profile’ as ball sports.

Although endurance athletes rarely used NSAIDs (6.8%±0.2 vs 27.3%±0.4 in power/sprint disciplines), their declared use of corticosteroids (15.0%±0.3 vs 4.6%±0.1) and β-2-agonists (6.8±0.2 vs 2.3%±0.1) increased significantly (p<0.05). In popular events such as the Bonn Marathon 2009, Berlin Marathon 2010 and El Andalus Ultramarathon, 47–61% of athletes used NSAIDs or other painkilling agents. The participants using NSAIDs had an almost five times higher incidence of adverse events (gastrointestinal cramps and bleeds, diarrhea, nausea, vomiting, headache, dizziness, and tinnitus) compared to athletes without NSAID use. The risk of gastrointestinal bleeding with NSAIDs is well documented, and the use of NSAIDs should be cautiously considered in athletes with a history of peptic ulcer disease or bleeding diathesis.

### Table 1  Tournament information

<table>
<thead>
<tr>
<th>Tournament</th>
<th>Teams (n)</th>
<th>Players (n)</th>
<th>Matches (n)</th>
<th>Reports (n)</th>
<th>Medications prescribed (n)</th>
<th>Intake of medication (per player, per match)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WC 2014</td>
<td>32</td>
<td>736</td>
<td>64</td>
<td>2944</td>
<td>2346</td>
<td>0.80</td>
</tr>
<tr>
<td>WC 2010</td>
<td>32</td>
<td>736</td>
<td>64</td>
<td>2944</td>
<td>2335</td>
<td>0.79</td>
</tr>
<tr>
<td>WC 2006</td>
<td>32</td>
<td>736</td>
<td>64</td>
<td>2944</td>
<td>2052</td>
<td>0.70</td>
</tr>
<tr>
<td>WC 2002</td>
<td>32</td>
<td>736</td>
<td>64</td>
<td>2944</td>
<td>2392</td>
<td>0.81</td>
</tr>
<tr>
<td>W-WC 2007</td>
<td>16</td>
<td>336</td>
<td>32</td>
<td>1344</td>
<td>1200</td>
<td>0.89</td>
</tr>
<tr>
<td>W-WC 2003</td>
<td>16</td>
<td>320</td>
<td>32</td>
<td>1280</td>
<td>1036</td>
<td>0.81</td>
</tr>
<tr>
<td>U-20 2007</td>
<td>24</td>
<td>504</td>
<td>52</td>
<td>2184</td>
<td>965</td>
<td>0.44</td>
</tr>
<tr>
<td>U-20 2005</td>
<td>24</td>
<td>504</td>
<td>52</td>
<td>2184</td>
<td>1248</td>
<td>0.57</td>
</tr>
<tr>
<td>U-17 2007</td>
<td>24</td>
<td>504</td>
<td>52</td>
<td>2184</td>
<td>1036</td>
<td>0.47</td>
</tr>
<tr>
<td>U-17 2005</td>
<td>16</td>
<td>320</td>
<td>32</td>
<td>1280</td>
<td>717</td>
<td>0.56</td>
</tr>
<tr>
<td>Total</td>
<td>248</td>
<td>5432</td>
<td>508</td>
<td>22 232</td>
<td>15 327</td>
<td>0.71</td>
</tr>
</tbody>
</table>

*U, under; W-WC, Women’s World Cup.*

---

**Figure 1** Prescribed medication during the FIFA World Cup. N=9124 for the 2002, 2006, 2010 and 2014 FIFA World Cups; N=2236 for the 2003 and 2007 FIFA Women’s World Cup; N=3966 for the 2005 and 2007 FIFA U-17/U-20 World Championships (NSAIDs, non-steroidal anti-inflammatory drugs; U, under; W-WC, Women’s World Cup).
ankle sprains. However, there are also reports of more swelling, weight bearing and return to play compared with placebo after
trolled trial has shown that NSAIDs permit earlier mobilisation, in
term and potentially also in the long term. Owing to its anti-

The routine use of NSAIDs in sport is harmful in the short
term and potentially also in the long term. Owing to its anti-
inflammatory effect, NSAIDs delay bone healing, 24, 25 decrease
protein synthesis and inhibit peritendinous hyperaemia and satel-
lite cells in skeletal muscle after exercise. 26–28 A randomised con-
trolled trial has shown that NSAIDs permit earlier mobilisation, weight bearing and return to play compared with placebo after ankle sprains. However, there are also reports of more swelling, an increased incidence of residual instability and a decreased range of motion in ankles. 29 This might be due to lower load-to-failure properties of the ‘healed’ ligament after the use of NSAIDs. 30 Also, DOMS (delayed onset of muscle soreness) can be treated with NSAIDs to reduce pain and enable earlier return to play. However, accompanying muscle weakness and imbalance are not improved. A precipitate return to sport before muscular balance is re-established might put the player at risk for inappro-
priate biomechanical stress and overuse injuries. 31

Knowledge translation and important questions
F-MARC campaigned to reduce the use of NSAIDs prior to the
2010 FIFA World Cup by informing all team physicians about
NSAIDs and their potential side effects on recovery processes after exercise bouts and on tissue healing. Despite this initiative, the reported intake of NSAIDs remained unchanged in 2010
and 2014.

Our review poses several salient questions: What is the indica-
tion for which one-third of players use NSAIDs prior to every
match, particularly when this greatly exceeds the rate of reported
injuries during the FIFA World Cup? Is the high prescription
practice due to a high number of non-time loss, chronic and
overuse injuries? 33 Are painkilling medications used routinely by
the players to overcome fatigue and muscle soreness due to phy-
cal overload, or even improve recovery? Or has it simply become
‘part of the game’ for players and team physicians?

Competing interests None.

Table 2 Number of players using a substance prior to a match or during the tournament

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per match</td>
<td>During the tournament</td>
<td>Per match</td>
</tr>
<tr>
<td></td>
<td>(N=11776) Per cent</td>
<td>(n=2944) Per cent</td>
<td>(N=2624) Per cent</td>
</tr>
<tr>
<td>Any medication</td>
<td>5179</td>
<td>44.0</td>
<td>2029</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>3737</td>
<td>31.7</td>
<td>1604</td>
</tr>
<tr>
<td>Injections*</td>
<td>422</td>
<td>3.6</td>
<td>234</td>
</tr>
<tr>
<td>Analgesics</td>
<td>588</td>
<td>5.0</td>
<td>376</td>
</tr>
<tr>
<td>β-2-Agonists</td>
<td>142</td>
<td>1.2</td>
<td>44</td>
</tr>
<tr>
<td>Myorelaxants</td>
<td>395</td>
<td>3.4</td>
<td>225</td>
</tr>
<tr>
<td>Any supplement</td>
<td>2985</td>
<td>25.3</td>
<td>984</td>
</tr>
</tbody>
</table>

*Injections of corticosteroids and/or anaesthetics.
NSAID, non-steroidal anti-inflammatory drugs; U, under; WC, World Cup.

Provenance and peer review Not commissioned; externally peer reviewed.

Open Access This is an Open Access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which
permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is
properly cited and the use is non-commercial. See: http://creativecommons.org/
licences/by-nc/4.0/

REFERENCES
2. Corrigan B, Kadauskas R. Medication use in athletes selected for doping control at the
3. Tsitsimpikou C, Tsiokanos A, Tsarouhas K, et al. Medication use by athletes at the
5. Tscholl PM, Alonso JM, Dolle G, et al. The use of drugs and nutritional supplements in
international soccer: data from 6 FIFA tournaments for female and youth players.
7. Tscholl P, Junge A, Dvorak J. The use of medication and nutritional supplements
8. Tscholl PM, Dvorak J. Abuse of medication during international football competition
11. Efe T, Saglini E, Roessler PP, et al. Perioperative topical diclofenac sodium 0.4%
spray gel into the synovial tissue and synovial fluid of the knee: a randomised clinical
12. Kuehl KS. Review of the efficacy and tolerability of the diclofenac epolamine topical
patch 1.3% in patients with acute pain due to soft tissue injuries. Clin Ther
cardiac and skeletal muscle damage in professional soccer players. Scand J Med Sci
15. Wharam PC, Speedy DB, Noakes TD, et al. NSAID use increases the risk of developing
related to the use of nonsteroidal anti-inflammatory drugs (NSAIDs) in student
19. Huang SY, Johnson K, Pipe AL. The use of dietary supplements and medications by
2006;16:27–33.


High prevalence of medication use in professional football tournaments including the World Cups between 2002 and 2014: a narrative review with a focus on NSAIDs

Philippe M Tscholl, Martin Vaso, Alexis Weber and Jiri Dvorak

doi: 10.1136/bjsports-2015-094784

Updated information and services can be found at:
http://bjsm.bmj.com/content/49/9/580

These include:

References
This article cites 31 articles, 9 of which you can access for free at:
http://bjsm.bmj.com/content/49/9/580#BIBL

Open Access
This is an Open Access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections
Articles on similar topics can be found in the following collections

Open access (275)
Drugs: musculoskeletal and joint diseases (87)

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/