Mortality in international professional football (soccer): a descriptive study

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Abstract

Objective

The objective of this study was to describe the characteristics of mortalities from 2007 to 2013 in active (during career) and recently retired (post career) professional footballers.

Method

An observational prospective study was conducted. From 2007, the World Footballers’ Union (FIFPro) and its related national footballers’ unions (more than 70 countries distributed across all continents) collected descriptive data (football-related, cause…) on mortality of active (during career) and recently retired (post career before reaching 45 years of age) professional footballers by means of several official sources.

Results

A total of 214 deaths were recorded among active and recently retired professional footballers, leading to an overall mortality rate of 0.47 per 1,000 footballers per year. Of the 214 deaths, 183 were recorded among active players and 31 among recently retired players. Among the active players, 17% of the fatalities were related to football participation. Disease was the leading cause of death among professional footballers (55%), of which up to 33% accounted for suspected cardiac pathology. Accidents accounted for 25% of all deaths, and suicide for 11%.

Conclusions

From 2007 to 2013, 214 deaths were recorded among active (during career) and recently retired (post career) professional footballers. Leading cause of death was disease (55%), one third of which were accounted for by suspected cardiac pathology, while accidents accounted for 25% of all deaths, and suicide for 11%. Attention to the predictive validity and application of heart-related pre-competition medical assessment should be given, and mental health support should be developed and implemented both during and after a professional football career to prevent potential suicidal behaviors.

Key Words: mortality, suicide, sudden cardiac death, soccer
Introduction

Football (soccer) is known as the most popular sport in the world. It is played by over 250 million people in more than 200 countries, while the number of fans supporting one or more professional football teams across all continents has recently reached 3.5 billion. Consequently, in recent years professional football has enjoyed a growing interest from the public and media, with players’ lives on and off the pitch being precisely reported on during their career but also after their retirement from sport. A similar level of interest has also been prevalent in the scientific literature: the exposure to football training and competition as well as the occurrence of musculoskeletal injuries among professional footballers have been frequently reported in empirical studies.

In contrast to studies about exposure and injuries, scientific evidence about mental illness, osteoarthritis, sudden cardiac death (SCD) or suicides are scarce or even lacking among professional footballers. In contrast, information about fatalities among professional, i.e. elite athletes from other sport disciplines is available in several studies. The occurrence of sudden death in young athletes aged from 12 to 35 years old has been estimated at 6 to 36 deaths per 10,000 athletes per year. In American football, it was shown that 718 fatalities occurred over a 55-year period (13 annually on average), while American football was found to be associated with the highest number of nontraumatic sports deaths in high school and college athletes. After retirement from professional sport, events with tragic outcome are likely to occurred as this period has been recognized as a critical phase for many athletes.

Despite the anecdotic reports available, especially with regard to suicide, to our knowledge there have been no international descriptive studies about fatalities in professional football. Scientific information about fatalities among players seems necessary in order to form a basis for further in-depth analyses and to establish patterns of mortality in professional football. Ultimately, scientific information about fatalities might lead to future self-awareness in professional football and would seem a necessary first step to developing and implementing prevention strategies designed to empower the health status of
the players. Consequently, the objective of our study was to describe the characteristics (demographic, geographic, football-related, cause…) of mortalities from 2007 to 2013 in active (during career) and recently retired (post career) professional footballers.

**Methods**

**Design**

An observational prospective study was conducted of all deaths occurring from 2007 up to 2013 among active (during career) and recently retired (post career) professional footballers.

**Data collection**

From January 2007 to December 2013, the World Footballers’ Union (FIFPro) and its related continental divisions (covering all countries across all continents through national unions) collected data on mortality of all active and recently retired professional footballers (union members and non-union members alike) in the world. Active professional footballers were defined as those of 18 years of age or older who have been committing significant time to football training and have been competing at a professional level according to the national regulation concerned. Recently retired professional footballers were defined as those of 45 years of age or younger (the period just after retirement recognized as critical for many athletes) who had committed significant time to football training and had competed at a professional level according to the national regulation concerned. In our study, we included former players up to 45 years of age because scientific literature shows that the period just after retirement from elite i.e. professional sports is especially a critical and difficult period in the life of any athlete.

Based on official club releases, official media releases and official websites, FIFPro’s continental divisions (covering all countries across all continents through national unions) were instructed to retrieve and report in a standardized way the following descriptive data of any observed death that occurred either in their country, neighboring countries or continent: date of birth or age, nationality, field position (goalkeeper or field player), career duration,
retirement duration (if applicable), date of death, place of death (continent) and cause of death. Also, for active players, it was noted whether death was directly related to football participation during training or competition (football-related) or not (non football-related). We strived to categorize causes of death as traffic accident, suicide, disease or violent crime. Traffic accident was defined as sudden death following an accident that occurred in traffic while being a driver or occupant of any vehicle. Suicide referred to sudden death as a result of taking one’s own life voluntarily and intentionally. Disease involved death following a pathological condition (including cardiovascular diseases and cancer) in one or more organ systems with or without previous known or reported symptoms or signs resulting from various causes such as infection, genetic defect, or environmental stress. Violent crime referred to sudden death as a consequence of a violent act such as shooting, stabbing or poisoning. We listed death as unclassified/unknown when the cause could not be reliably established.

Data collected through standardized forms were entered in a single database by one researcher, and 20% of the data entry was randomly checked by a second researcher. Any disagreements were resolved by consensus. In order to control the retrieved data and enhance its validity, as well as to avoid potentially missing information, three additional sources were consulted: (i) Wikipedia database, which is available online as an open computerized registry of all deaths of notable people, including current and retired professional footballers, (ii) Google search engine, and (iii) Infostrada Sports which is an international sports and media company specialized in producing, distributing, publishing and monetizing sports data. The present study was exempt from official ethical approval accordingly to the Tri-Council Policy Statement related to Ethical Conduct for Research Involving Humans (Canada) and was conducted in accordance with the Declaration of Helsinki (2013).

Statistical analyses
All data were tabulated and descriptive data analyses (mean, standard deviation, frequency, range) for characteristics and for nature, cause and location of death were performed for the
whole study period and by calendar year. Overall mortality rate was calculated as the ratio between number of all deaths during the 7-year period and the estimated total number of professional footballers in the middle of the 7-year period, and was expressed per 1,000 players per year.\textsuperscript{25} Based on information provided by FIFPro’s continental divisions (covering all countries across all continents through national unions), the number of active and recently retired professional footballers as defined in our study was a constant number of 65,000. Leading causes of death from 2007 to 2013, overall proportional mortality ratio and specific mortality rates among professional footballers were computed. Overall proportional mortality ratio (%) according to cause of death was calculated as the ratio between number of deaths from a given cause and number of total deaths.\textsuperscript{25} Specific mortality rates (expressed per 10,000 per year) according to cause of death were calculated as the ratio between number of deaths with respect to specific cause during the 7-year period and the estimated total number of professional footballers in the middle of the 7-year period.\textsuperscript{25} All data analyses were performed using the statistical software IBM SPSS Statistics 22.0 for Windows.

**Results**

Descriptive data over the whole study period and by calendar year for characteristics, nature, cause, and location of observed deaths are presented in table 1. From 2007 to 2013, a total of 214 deaths was recorded among active and recently retired professional footballers, leading to an overall mortality rate of 0.47 per 1,000 footballers per year. Fatalities occurred on average at 30 years old, after a mean football career duration of 12 years. Almost half of the fatalities occurred in Europe (48%), which is not surprising as nearly 60% of professional footballers come from the European continent. Of the 214 deaths, 148 were recorded among active players and 66 among retired players. Among the active players, 17% of the 148 fatalities were related to football participation.

Leading causes of death from 2007 to 2013, overall proportional mortality ratio and cause-specific rates among professional footballers are presented in table 2. Disease (cancer, infectious diseases...) was the leading cause of death over the 7-years period
among professional footballers (55%), of which up to 33% were accounted for by suspected cardiac pathology. Accidents accounted for 25% of the overall deaths, professional footballers being especially involved in road accidents. Suicide accounted for 11% of the overall deaths.

Discussion

The aim of the study was to describe the characteristics of mortalities from 2007 to 2013 in active and recently retired professional footballers. A total of 214 deaths were observed (148 among active players and 66 among retired players), leading to an overall mortality rate of 0.47 per 1,000 footballers per year. Among the active players, 17% of the fatalities were related to football participation. Over the 7-year period, disease was the leading cause of death among professional footballers (55%), up to 33% of which were accounted for by suspected cardiac pathology. Accidents (especially road accidents) accounted for 25% of the overall deaths, and suicide for 11%.

As far as the authors know, the present study is the first international study to describe the mortality characteristics among professional footballers. Over a 7-year period, we observed a total of 214 deaths, almost half of which occurred in Europe, which is not surprising since the number of professional footballers is the highest on that continent. Most of the studies about mortality have been conducted in the general population rather than among specific young adult populations such as in professional, i.e. elite athletes, or footballers. Among young male adults (20 to 40 years old, similar to our study population), a constant 10 to 20 deaths per 10,000 per year are reported worldwide, which is more than twice as high as the mortality rate found in our study. To put our findings in a more accurate perspective, comparison can be done with other sport-related mortality studies. To our knowledge, only two studies have explored the death of professional footballers, both conducted in Italian players. In 2005, Belli and Vanacore investigated the mortality between 1960 and 1996 of Italian footballers active in the three highest leagues. A total of 350 deaths were observed over
the study period in the set of 24,000 players recruited in their study, leading to an overall mortality rate to the one found in our study. In their study, Belli and Vanacore also found that the primary cause of fatalities was diseases (cancer 36%; cardiac 22%), followed by violence (20%). In 2007, Taioli studied the mortality of Italian professional footballers active in the two highest leagues between 1975 and 2003. The author found a total of 63 deaths in that period, the primary cause of fatalities being car accidents. In this study, Taioli also specified the number of deaths per position played in the professional team. The author showed that players who died were less likely to have been a goalkeeper during their career, which concurs with the findings in our study: taking one’s own life voluntarily and intentionally was not related to the goalkeeper position on the field (post hoc Chi-square test not statistically significant). Recently, Boden et al. (2013) published a descriptive epidemiological study about mortality among college- and high school American football players. The authors identified 243 fatalities (all male) between 1990 and 2010, leading to a lower overall mortality rate (0.09 – 0.25 per 10,000 athletes per year) than the one found in our study. The most common cause reported for these fatalities among young athletes was cardiac (41.2%). Between 1946 and 2000, top athletes (male and female) involved in the twentieth century Olympic Games were enrolled in a cohort study about mortality in Poland. Among former elite athletes, several studies about fatalities are available in the scientific literature. Lindqvist et al. (2013) explored the mortality of Swedish former athletes who were involved in power sports (wrestling, Olympic lifting, power lifting and throwing) between 1980 and 2008. A total of 181 deaths were observed (3.0 deaths per 1,000 athletes per year). The leading causes of these fatalities were cardiovascular pathology, malignant diseases, suicide and accidents. A study conducted in Finland among competitive power lifters (suspected to have used anabolic agents) during a 12-year follow-up showed eight deaths observed among 62 athletes (suicide and cardiac being leading causes), which is relatively higher than the number of mortalities we observed. In our study, the number of observed deaths increased noticeably from 2008 (13
deaths) to 2009 (31 deaths), remaining quite constant in the subsequent years. Such an increase (nearly 250%) can not be attributed to any concrete logical reason and remains difficult to interpret.

We should point out some limitations and strengths of our study. The strength of our study relies on the topic covered, namely the mortality of current or recently retired professional footballers, and on the prospective design applied. In contrast, as in any scientific research, data collection is a critical process and its validity should be critically reviewed. In our study, data on the mortality of active and recently retired professional footballers were collected by FIFPro and its continental divisions. FIFPro and its continental divisions are distributed in all countries across all continents, representing and monitoring more than 100,000 current and retired professional footballers. Internationally, it remains doubtful whether the same official sources and resources are available for all countries, which might have introduced some bias. To tackle this issue, and in order to control the retrieved data and to avoid potentially missing information, strategies were adopted through the data check of the international Wikipedia database and search engine Google, and through the data check conducted by an international sports and media company specialized in producing, distributing, publishing and monetizing sports data (Infostrada Sports). However, despite the application of standardized procedures, the validity of the mortality data in our study might have been affected and it is not possible to completely exclude a few missing values. In addition, we did not have precise information about the medical diagnosis of all deaths (caused by disease), which might be considered as a potential limitation. With regard to the methodological limitations of our study, and considering that the prospective data collection of all deaths among players (current and retired) is still ongoing, FIFPro (and its continental divisions) should review critically how the validity of future data collection (and related analyses) could be improved in order to avoid any form of bias. A potential improvement of the data validity might be the use of national or governmental registers (national retirement systems) as it was done in the study of Taioli among of Italian professional footballers.²⁹
To our knowledge, this is the first international study to describe the mortality characteristics among professional footballers. By enabling patterns of mortality in professional football to be established, such a descriptive study might form a basis for future self-awareness and prevention strategies. Of course, these strategies should focus on preventable death. In our study, we found that disease was the leading cause of death among professional footballers (55%), up to 33% of which were accounted for by suspected cardiac pathology. In current players (exclusively), post-hoc analyses showed that disease was also the leading cause of fatalities (50%), 56% of which were accounted for by suspected cardiac pathology that was related to football participation in more than 50% of the cases. To prevent sudden cardiac death (SCD), governing football bodies (FIFA, UEFA, AFC...) have made a heart-related pre-competition medical assessment (PCMA; based on the Lausanne recommendations combined with stress-ECG and/or echocardiography) mandatory for top international and continental competitions but only recommended to other leagues. This is definitely unusual and difficult to explain to any stakeholder, as the health of any professional footballer, whether playing in the Champions League or at a lower professional level, should be optimally protected in the same way according to the latest evidence-based protocols and criteria. Furthermore, the consistent application of PCMA at the national level in all professional football clubs remains doubtful. In addition, the lack of scientific evidence concerning the predictive validity of PCMA for SCD has been acknowledged in several studies, especially the doubtful value of rest- and stress-ECG, as well as the difficulty involved in its interpretation. Hopefully, the recent developments about a better interpretation of the 12-leads rest-ECG in athletes (the so-called ‘Seattle recommendations’) might contribute to a higher predictive value of PCMA for SCD.

In our study, suicide accounted for 11% of the overall deaths among professional footballers. Suicide in professional football, which might occur as a consequence of mental illness, has been anecdotally reported in the media. However, in contrast to research about musculoskeletal injuries, scientific studies about mental illness in professional football remain
scarce. In a recent study, 25 to 40% of current and retired professional footballers reported some mental health problems related to anxiety/depression and adverse health behaviors. These findings, as well as the results of our study, endorse the importance of developing and implementing some mental health support both during – and especially after – a professional football career, with the critical period just after retirement increasing the likelihood of mental health problems and, in the worst cases, suicide.¹⁴,¹⁵

**Conclusions**

The present study described 214 deaths from 2007 to 2013 in professional footballers up to 45 years of age, resulting in a mortality rate of 0.47 per 1,000 footballers per year. Disease accounted for 33% of the overall deaths, accidents for 25% and suicide for 11%. In players currently active in professional football, disease was the leading cause of fatalities (50%), 55% of which were accounted for by suspected cardiac pathology that was related to football participation in more than 50% of the cases. With regard to these findings, a yearly PCMA should be made mandatory for all professional footballers at all levels of professional football, and should be carried out by sports cardiologists i.e. physicians experienced in the interpretation of normal/abnormal ECGs in elite athletes. Also, attention should be directed towards improving the management of sudden cardiac arrest on the football pitch according to latest evidence-based guidelines. With regard to suicidal behavior in footballers, mental health support should be developed and implemented both during and after a professional football career.

**Table titles**

Table 1: Number of observed deaths by nature and cause of death, and by calendar year among active and recently retired professional footballers

Table 2: Leading causes of death from 2007 to 2013 among active and recently retired professional footballers
References

8. Gouttebarge V, Sluiter JK, Frings-Dresen. Mental and psychosocial health among current and former professional football players. Submitted


Table 1: Number of observed deaths by nature and cause of death, and by calendar year among active and recently retired professional footballers.

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
</tr>
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<td>6</td>
<td>13</td>
<td>31</td>
<td>40</td>
<td>39</td>
<td>43</td>
<td>42</td>
<td>214</td>
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<tr>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean age (yrs)</td>
<td>26</td>
<td>27</td>
<td>31</td>
<td>29</td>
<td>31</td>
<td>32</td>
<td>29</td>
<td>30</td>
</tr>
<tr>
<td>Career duration (yrs)</td>
<td>9</td>
<td>9</td>
<td>13</td>
<td>14</td>
<td>11</td>
<td>16</td>
<td>15</td>
<td>12</td>
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<td>Goalkeeper</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>8 (4%)</td>
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<td>Retired</td>
<td>1</td>
<td>0</td>
<td>9</td>
<td>8</td>
<td>13</td>
<td>20</td>
<td>15</td>
<td>66 (31%)</td>
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<td><strong>Nature of death</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Football-related*</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>9</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>25 (16.9%)</td>
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<tr>
<td><strong>Cause of death</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Accident</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td>11</td>
<td>8</td>
<td>6</td>
<td>48 (22.4%)</td>
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<tr>
<td>Suicide</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>22 (10.3%)</td>
</tr>
<tr>
<td>Disease</td>
<td>3</td>
<td>3</td>
<td>14</td>
<td>21</td>
<td>16</td>
<td>27</td>
<td>24</td>
<td>108 (50.5%)</td>
</tr>
<tr>
<td>Cardiac</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>11</td>
<td>6</td>
<td>14</td>
<td>10</td>
<td>50 (23.4%)</td>
</tr>
<tr>
<td>Violent crime</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>17 (7.9%)</td>
</tr>
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<td>0</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>7</td>
<td>19 (8.9%)</td>
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<td><strong>Continent</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>42 (19.6%)</td>
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<tr>
<td>Asia</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>7</td>
<td>23 (10.7%)</td>
</tr>
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<td>Central America</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>13 (6.1%)</td>
</tr>
<tr>
<td>Europe</td>
<td>1</td>
<td>7</td>
<td>17</td>
<td>20</td>
<td>16</td>
<td>23</td>
<td>18</td>
<td>102 (47.7%)</td>
</tr>
<tr>
<td>North America</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>5 (2.3%)</td>
</tr>
<tr>
<td>Oceania</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2 (0.9%)</td>
</tr>
<tr>
<td>South America</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>1</td>
<td>5</td>
<td>27 (12.6%)</td>
</tr>
</tbody>
</table>

* Only for active professional footballers
Table 2: Leading causes of death from 2007 to 2013 among active and recently retired professional footballers.

<table>
<thead>
<tr>
<th>Rank order</th>
<th>Cause of death</th>
<th>Number</th>
<th>Proportional mortality ratio (%)</th>
<th>Cause-specific death rate per 10,000**</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Disease</td>
<td>108</td>
<td>55.4</td>
<td>2.37</td>
</tr>
<tr>
<td>2</td>
<td>Accident</td>
<td>48</td>
<td>24.6</td>
<td>1.05</td>
</tr>
<tr>
<td>3</td>
<td>Suicide</td>
<td>22</td>
<td>11.3</td>
<td>0.48</td>
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<tr>
<td>4</td>
<td>Violent crime</td>
<td>17</td>
<td>8.7</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td>All causes</td>
<td>195*</td>
<td></td>
<td>4.28</td>
</tr>
</tbody>
</table>

* 19 unknown causes excluded; ** population estimation per year at 65,000