
SHORT REPORT

Risk factors for hepatitis C virus infection in former Brazilian soccer players

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(Accepted 1 March 2011; first published online 25 March 2011)

SUMMARY

We evaluated the occurrence of hepatitis C virus (HCV) infection in 97 former soccer players who played in Recife, Brazil in the 1960s and 1970s, and analysed the risk factors for infection, such as history of transfusions, surgery, tattoos, piercings, and the use of illicit drugs or injectable vitamin complexes. Immunochromatographic testing was performed to detect anti-HCV antibodies. All former soccer players were men (mean age 59·2 years), of whom 62 (64%) and 35 (36%) were classified as amateurs and professionals, respectively. Seven (7·2%) tested positive for anti-HCV antibodies; three (4·8%) were amateurs, and four (11·4%) were professionals. In univariate analysis, transfusion, surgery, and use of injectable vitamin complexes were associated with HCV infection, while in multivariate analysis, only the use of injectable vitamin complexes was related ($P=0\cdot0005$). We observed a high frequency of HCV infection in former soccer players, especially in professionals who used injectable vitamin complexes.

Key words: Epidemiology, HCV, intravenous vitamin complexes, soccer players.

Hepatitis C virus (HCV) infection has a worldwide distribution. Data from the World Health Organization indicate an infection rate of 2–3% globally, which corresponds to 130–190 million infected individuals [1].

Transmission of the virus occurs through at least three epidemiological patterns [2]. The first is observed in adults aged between 30 and 49 years, who acquire the infection with illicit drug use and less frequently by blood transfusion, as seen in the USA and Australia. Second, HCV is identified in the elderly, who acquire the infection over many years through injections with glass syringes and transfusions, as seen in Japan and Italy. The third pattern is observed both in young adults and the elderly, who acquire the

infection in the past or more recently, as seen in developing countries, e.g. Egypt [2].

In Latin America it is assumed that infection occurs predominantly through the second pattern because the prevalence of HCV infection proportionately increases in individuals with age and some patients were found to be infected through blood transfusions. However, a large number of patients do not report transfusion history or the use of illicit drugs, suggesting possible use of glass syringes [3, 4]. Data from a small rural community in Argentina have shown that the prevalence of viral infection increases with age, and infection is caused by the same HCV genotype; this indicates that the virus has been spreading for many years, possibly via glass syringes [5].

In Brazil, some authors have also reported cases of HCV infection acquired by using glass syringes. In fact, the use of injectable vitamin complexes (IVCs), especially by young people and soccer players in the

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1960s and 1970s, was common in order to improve their sexual and/or athletic performance [6].

In view of these facts, this study aimed to evaluate the occurrence of HCV infection in former soccer players and to analyse the risk factors for HCV infection. For this purpose, we studied HCV cases in former soccer players in Recife, who played as professionals or amateurs in the 1960s and 1970s.

Data were collected between September 2009 and January 2010 through an active unpaid volunteer recruitment of former soccer players in weekend soccer games in the metropolitan area of Recife. The protocol was approved by the Ethics Research Committee of Health Sciences Center from the Federal University of Pernambuco under registration number 201/09. The candidates understood the objectives and methodology of the research, and informed consent was obtained. The players completed a questionnaire in which details were obtained regarding whether they were professional or amateur soccer players (period and clubs), whether they had history of any blood transfusions, surgery, tattoos, piercings, and illicit drug use or IVCs. Blood samples were collected (one drop of blood through a punctured fingertip) and assayed for anti-HCV antibodies (HCV Rapid Test Bioeasy[®], Brazil) [7].

Players who reported a previously diagnosed HCV infection were excluded in order to avoid selection bias. The candidates were divided into two groups, i.e. professionals and amateurs, as follows.

- Group I included professional soccer players who played for at least 1 year in Recife in the 1960s or 1970s with a formal contract and earning wages.
- Group II included players who were part of an amateur soccer club for at least 1 year in Recife during the same period but did not receive any payment.

Former soccer players who tested positive for HCV antibodies were sent to the outpatient clinic of the Department of Internal Medicine at the Hospital das Clínicas at the Federal University of Pernambuco for further evaluation and clinical monitoring.

HCV infection was confirmed using polymerase chain reaction (PCR) for HCV-RNA, and the genotype was obtained by Cobas Amplicor Monitor INNO-LiPA 2.0 (Roche Diagnostics[®], USA).

A database was developed using Microsoft Excel 2007 (USA), and data were analysed using Epi Info v. 3.4 (CDC, USA). The calculations of frequency and statistical tests of association between independent

variables and HCV infection were performed using Fisher's exact test or χ^2 test. Variables with P values ≤ 0.20 were also subjected to multivariate analysis.

Former soccer players ($n=101$, all players male) were interviewed, and four who were known have HCV infection were excluded from the study to avoid selection bias. Of the remaining 97 players, 62 (64%) were classified as amateurs and 35 (36%), as professionals. The average age of all players was 59.2 (s.d.=6.6) years, and that of professionals and amateurs was 59.8 and 58.4 years, respectively.

Of the 35 professionals, 24 (69%) had played for clubs in other cities besides Recife, while 29 (83%) still practised soccer occasionally. All the 62 amateurs still played soccer occasionally during the weekend.

Of the 97 former players, seven (7.2%) tested positive in the anti-HCV test (95% CI 3.0–14.3). The infection was confirmed through HCV-RNA, in which six players were found to have been infected with genotype 1, and one player, with genotype 3. Of these seven infected individuals, four (11.4%) belonged to the professional group ($n=35$, 95% CI 3.2–26.7) and three (4.8%), to the amateur group ($n=62$, 95% CI 1.0–13.5).

Table 1 shows the distribution of the reported risk factors according to the results of anti-HCV antibody test in the 97 former players.

The distribution of risk factors revealed a significant correlation between the result of the anti-HCV antibody test and previous IVC use ($P=0.004$). Of the four former professional players who tested positive for anti-HCV antibodies, three (75%) reported using IVCs, while of the three infected amateurs, two (66.7%) used IVCs ($P=0.1$).

Of the 21 players who used IVCs, three (14.3%) reported using disposable syringes, and these players tested negative for anti-HCV antibodies. In addition, seven (33.3%) reported that the glass syringes they used were placed in a boiling water bath and were reused by other players, while 11 (52.4%) did not remember the kind of syringe they used or if it was shared among the players.

Table 1 shows that three variables (previous surgeries, IVC use, history of blood transfusion) were present at $P \leq 0.20$ and these were subjected to multivariate analysis (Table 2). Only IVC use was correlated ($P=0.0005$) with anti-HCV test positivity (95% CI 2.0–64.9).

The results show a higher frequency of HCV infection (7.2%) in former soccer players who played in the 1960s and 1970s than in the general Brazilian

Table 1. Results of anti-hepatitis C virus (HCV) antibody test in relation to the risk factors in 97 former professional and amateur soccer players from the 1960s and 1970s in Recife in 2010

| Anti-HCV | Positive | Negative | P |
|------------------------------|----------|----------|-------|
| Professional | | | 0.21 |
| Yes | 4 | 31 | |
| No | 3 | 59 | |
| Surgeries | | | 0.09 |
| Yes | 4 | 23 | |
| No | 3 | 67 | |
| Injectable vitamin complexes | | | 0.004 |
| Yes | 5 | 16 | |
| No | 2 | 74 | |
| Haemotransfusion | | | 0.2 |
| Yes | 2 | 10 | |
| No | 5 | 80 | |
| Piercing | | | 0.46 |
| Yes | 1 | 7 | |
| No | 6 | 83 | |
| Tattoos | | | 0.41 |
| Yes | 1 | 6 | |
| No | 6 | 84 | |
| Intravenous illicit drugs | | | 0.26 |
| Yes | 1 | 3 | |
| No | 6 | 87 | |

population, whose anti-HCV prevalence ranged between 0.8% and 2.8% [1, 4].

Focaccia *et al.* have described a population-based study conducted in São Paulo, in which the prevalence of HCV infection in individuals aged between 50 and 59 years was 3.8% [4]. The present study, including former players in the same age group (59.2 years), showed that the occurrence of HCV infection was high (7.2%), especially in the professional group (11.2%). However, the occurrence of infection in amateurs (4.8%) was similar in players falling in the above-mentioned age group; this finding could suggest that in Brazil, many young people used IVCs with glass syringes as stimulants in the 1960s and 1970s [4].

An interesting finding that strongly suggests that glass syringes are a means of HCV transmission was noted in Egypt, the country with the highest prevalence rates of HCV infection in the world. Frank *et al.* have reported that the main cause of the spread of HCV infection during the second half of the last century was mass treatment against schistosomiasis with non-disposable needles and glass syringes. This procedure has been considered to be the main form of iatrogenic spreading of HCV [8].

Table 2. Multivariate analysis ($P \leq 0.20$) of risk factors for the occurrence of HCV infection in 97 former professional and amateur soccer players from the 1960s and 1970s in Recife in 2010

| Variable | OR | 95% CI | P |
|----------------------------|---------|----------------|----------|
| Surgeries | 3.8841 | 0.8080–18.6717 | 0.197427 |
| Injectable vitamin complex | 11.5625 | 2.0568–64.9984 | 0.000562 |
| Haemotransfusion | 3.2000 | 0.5469–18.7252 | 0.157699 |

OR, Odds ratio; CI, confidence interval.

Recently, in a rural community in China, the high prevalence of HCV infection in the elderly population was attributed to the administration of multiple injections with glass syringes [9].

Studies have also revealed a high incidence of HCV infection in former soccer players in Brazil [6, 10, 11]. Paraná & Lyra described three former soccer players from the same club infected with the same HCV genotype (1a). These players reported sharing syringes for 'boosters' to improve a player's physical performance before a game [6].

In 2003, Souto *et al.* found a HCV prevalence of 7.5% in 40 former professional soccer players in Mato Grosso State in the 1970s and 1980s where the only risk factor identified was the sharing of syringes for IVCs [10]. Passos *et al.* conducted a study in São Paulo State with former soccer and basketball players (professional and amateur), and also found a higher frequency of HCV infection, in both professionals (11.1%) and amateurs (5.5%). Further, the use of IVCs among infected athletes was significantly more frequent [11].

Our study has some limitations. The absence of a registry of players forced us to undertake an active recruitment for information in which participants named other athletes and to visit soccer clubs in the metropolitan area of Recife. The longer lag time between the period of exposure to risk factors and data collection may have propitiated a memory bias that may produce less accurate responses, especially regarding use of IVCs. The possibility of a survival bias and an underestimation of the infection frequency cannot be ruled out because chronic hepatitis caused by HCV takes several years to evolve into liver cirrhosis or hepatocellular carcinoma. Indeed, some patients with liver disease could have already undergone transplantation or had a fatal outcome. In addition, many former players do not continue to

perform sports activities, probably because of symptoms of hepatitis or associated diseases, preventing contact with these athletes. This is another limiting factor as almost all participants in the present study still practice sport.

All data related to soccer and HCV infection are from Brazilian studies because of the popularity of soccer in Brazil; however, further studies are needed to verify whether the same association also occurs in other countries. Because of the use of glass syringes and IVCs, it is possible that there may be a high frequency of HCV infection in former players of other sports, especially collective sports, e.g. basketball or American football.

Finally, it is possible to conclude that this study group of former soccer players, both professional and amateur, from the 1960s and 1970s showed an increased rate of HCV infection, and that the use of glass syringes for vitamin complexes could be one of the responsible routes for viral transmission. Therefore, this should be considered a health concern in other countries that have a large number of soccer players, in order to alert health professionals about the investigation of risk factors for HCV infection.

ACKNOWLEDGEMENTS

The authors thank all the study participants for their cooperation and the Universidade Federal de Pernambuco for support in the study.

DECLARATION OF INTEREST

None.

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