

Risk of infectious mononucleosis among agonistic swimmers: a cross-sectional study

M.S. Gallone¹, L. Astuto², G. Mastrorilli², R. Tamma³, L. Ascigno², D. Sinesi², A. Notarnicola^{2,4}, S. Tafuri⁵

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Parole chiave: Atleti, nuotatori, open window, sovrallenamento, comportamenti igienici

Abstract

Background. The risk of infectious mononucleosis among athletes is quite debated. Some personal observations seem to suggest an increase risk of mononucleosis among athletes, because they attend always close settings with an high probability of respiratory pathogens transmission; overtraining has been also proposed as risk factor.

Study design. Cross-sectional study in a group of swimmers (aged 11-14 years) of the University Sport Centre of Bari

Methods. 40 swimmers were interviewed by healthcare personnel at the end of training courses; demographic characteristics, personal habits, information about sport training and diagnosis of mononucleosis were analysed.

Results. The life-time incidence of mononucleosis was around 40%; multivariate analysis showed the association between mononucleosis and use of bottles of other persons (*aOR*=8.2; 95% *CI*=1.4-49.2; *z*=2.32; *p*=0.021) and average duration of training session was longer among subjects who reported mononucleosis than in subjects who did not indicate this disease.

Conclusions. Future multi-centric studies are needed to better define the epidemiology of the mononucleosis in sport settings and to formulate appropriate recommendations to prevent the spreading of this disease.

Introduction

Infectious mononucleosis is a clinical syndrome caused by the Epstein-Barr virus (EBV) that is very common in adolescents and children. Typical features of infectious mononucleosis include fever, pharyngitis, adenopathy, malaise and an atypical lymphocytosis. Splenomegaly, hepatomegaly, jaundice and even splenic

rupture can occur in patients with infectious mononucleosis, but these complications are rare (1).

EBV spreads most commonly through bodily fluids, especially saliva. However, EBV can also spread through blood and semen during sexual contact, blood transfusions and organ transplantations. EBV can be spread by using objects that an infected person recently used, such as toothbrush or drinking

¹ MD, Department of Biomedical Science and Human Oncology, University of Bari Aldo Moro, Bari, Italy

² Degree Course of Motor and Sport Sciences, University of Bari Aldo Moro, Bari, Italy

³ Department of Physic, University of Bari Aldo Moro, Bari, Italy

⁴ PhD, Orthopaedics Unit, Department of Basic Medical Science, Neuroscience and Sensory Organs, University of Bari Aldo Moro, Bari Italy

⁵ MD, PhD, Department of Biomedical Science and Human Oncology, University of Bari Aldo Moro, Bari, Italy

glass. The virus probably survives on an object at least as long as the object remains moist (2).

The frequency of infectious mononucleosis is difficult to measure because of the wide differences that occur between populations (developed versus developing countries) and within populations (depending on age and socioeconomic status). Nevertheless, in developed countries an annual incidence of approximately 5 per 10,000 population would appear to be a realistic estimate (3). The infection is most common in communities with many young adults, such as active-duty military personnel and college students, in whom the annual incidence ranges from 11 to 48 cases per 1,000 persons (4, 5).

The risk of infectious mononucleosis among athletes is quite debated. A study carried out in 2006 among 202 endurance athletes and 200 controls seems to indicate that endurance athletes could not be considered more susceptible to EBV infections than the general population. In addition, no differences were found with respect to serological patterns between athletes and the control group (6). A survey, published in 2012 and performed in a group of young swimmers, showed that positive anti-EBV-IgG may persist in healthy athletes but this positivity should not be used to diagnose EBV reactivations or to identify a compromised immune function (7).

In contrast, some personal observations seem to suggest an increase risk of spread of mononucleosis among athletes, because they attend always close settings where there is an high probability of respiratory pathogens transmission (8, 9). Among swimmers, the microbiological quality of water could be another risk factor for spread of mononucleosis (10).

A study carried out in 2002 among 14 Australian highly trained men aged 18–27 years provides the first conclusive evidence of significant latent EBV viral shedding in athletes undertaking intensive training but

this topic has not been extensively analysed in the following years (11).

To assess the risk of spread of mononucleosis among young swimmers, we carried out a cross-sectional study in a group of athletes of the University Sport Centre of Bari.

Methods

We conducted a retrospective, cross-sectional study among the group of young athletes of Swim Division of the University Sport Centre of Bari (aged 11-14 years).

Informed consents of parents were preliminary requested and obtained. Swimmers were interviewed by healthcare personnel at the end of training courses and data were collected in a standardized form.

The form provided the following information:

- Age
- Gender
- Number of years of sport training attendance
- Number of training sessions per week
- Average duration of each training session
- Average study time per day
- Close contact with mononucleosis cases
- Use of cutlery, towels, bottles of other persons
- Consumption of food snapped by other people
- Previous diagnosis of infectious mononucleosis, carried out by a physician.

Completed forms were computerized using a Google Drive database and data were analysed by STATA MP11 software.

Continuous variables were described as means \pm standard deviation; for continuous variables, the analysis of normality distribution was carried out and, if necessary, appropriate normalization was performed. T-test was used to compare

means between subjects who reported mononucleosis and subject who didn't report this diagnosis.

Categorical variables were described as proportions and proportions between two groups were compared by chi-square test.

Determinants of mononucleosis were studied by univariate analysis; Odds Ratio (OR) with 95% confidence intervals were calculated for these determinants:

- Number of training sessions per week
- Average duration of each training session
- Average study time per day
- Close contact with mononucleosis cases
- Use of cutlery, towels, bottles of other persons
- Consumption of food snapped by other people

Z-score test was performed in the univariate analysis.

Using a logistic multivariate model, the analysis was repeated for determinants significantly associated with mononucleosis in the univariate analysis, considering as confounding factors age, gender and number of years of sport training attendance. Significance was set at $p < 0.05$.

Results

40 athletes were enrolled (response rate 100%), of which 15 (37.5%) reported a previous diagnosis of mononucleosis. 8/15 (53.4%) reported the diagnosis in the last 6 months, 3 (20%) 6-12 months before the survey and 4 (26.7%) in the previous years (2009-2014).

The percentage of males was 50% ($n=20/40$), without difference between mononucleosis group (9/15, 60%) and control group (14/25, 56%, $\chi^2=0.96$,

$p=0.33$). The average age was 13.8 ± 2.3 , without differences between the two groups ($t=0.05$; $p=0.96$).

The average number of years of sport training attendance was 6.2 ± 3.4 , 6.9 ± 3.6 for mononucleosis group and 5.8 ± 3.3 for control group ($t=0.9$; $p=0.37$). The number of training sessions per week was 5.8 ± 0.7 without difference between the two groups ($t=0.25$; $p=0.8$); the average duration of each training session was slightly higher for mononucleosis group (2.13 ± 0.35) than for control group (2 ± 0 ; $t=1.9$; $p=0.03$).

Enrolled subjects declared to spend 2.8 ± 1.2 hours daily studying, without differences between the two groups ($t=0.17$; $p=0.86$).

31 (77.5%) enrolled athletes reported a close contact with a case of mononucleosis; this percentage did not differ between subjects with a previous diagnosis of mononucleosis (13/15, 86.7%) and subjects who did not report this diagnosis (18/25; 72%; $\chi^2=1.1$; $p=0.28$).

5 subjects (3 of the mononucleosis group and 2 of the control group; $\chi^2=1.2$; $p=0.27$) reported the use of towels of other persons. Use of water bottle of other persons was more frequent among mononucleosis group (10/15; 66.7%) than controls (4/25; 16%; $\chi^2=10.6$; $p=0.0001$). Use of cutlery of other persons was referred by 3 (7.5%) subjects, 1 of mononucleosis group and 2 from control group ($\chi^2=1.2$; $p=0.3$). Also the habit of consuming food snapped by other people was more frequent in mononucleosis group (11/15; 73.3%) than in control group (9/25; 36%; $\chi^2=5.23$; $p=0.022$).

Univariate analysis of determinants is reported in table 1.

Multivariate analysis confirmed the association between mononucleosis and use of bottles of other persons (aOR=8.2; 95% CI=1.4-49.2; $z=2.32$; $p=0.021$).

Table 1 - Univariate analysis of determinants of mononucleosis

Determinant	OR	95% CI	z	p
Number of training sessions per week	1.3	0.4-4.1	0.47	0.641
Average duration of each training session	1.4	0.8-2.4	1.37	0.17
Average hours spent for the study daily	1.05	0.6-1.8	0.18	0.86
Close contact with mononucleosis cases	2.5	0.45-14.2	1.05	0.29
Use of towels of other persons	2.9	0.42-19.6	1.08	0.281
Use of cutlery of other persons	4.7	0.3-44.7	1.03	0.305
Use of bottles of other persons	10.5	2.3-47.8	3.04	0.002
Consumption of food snapped by other people	3.5	1.2-19.9	2.21	0.03

Discussion and conclusions

In our cross-sectional survey, carried out among a group of young athletes who reported daily training session of 2 hours, an high life-time incidence (around 40%) of mononucleosis has been documented. Several cases were reported to have taken place in the last six months before the survey, then we can conclude that this group was involved in an outbreak, with inter-human transmission of the EBV. Unfortunately, the original design of the study was not able to detect the index case and to design the epidemic curve.

Analysing the outbreak spreading, we have to consider the low awareness of athletes, coaches and parents about the symptoms of mononucleosis; probably contagious subjects were admitted to training sessions in the first phase of the disease, when symptoms are less evident and could be confounded with other diseases, such as a common upper respiratory infection.

The use of bottle of other persons seems the most important risk factor for the disease; moreover, univariate analysis seemed to indicate a role of the habit of consuming food snapped by other people. The occurrence of these habits could be related to the age of enrolled population; people aged 11-14 years could have poor compliance with correct hygiene measures (12).

The sample of our survey is too small to study some determinants, such as the frequency of training session or time spent studying, that are at the basis of the "open window hypothesis" about the spreading of mononucleosis among athletes (13). There is an emerging signal about the duration of training session, that is longer among subjects who reported mononucleosis than in subjects who did not indicate this disease.

The principal limitation of this study is the tool for the collection of information, because an interview with close questions could be not strictly suitable in correctly evaluating personal habits, such as the consumption of food snapped by other people.

Future multi-centric studies are needed to better define the epidemiology of the mononucleosis in sport settings and to formulate appropriate recommendations to prevent spread of this disease: not only not to share water bottles, but also to sleep adequately in the night, to eat well and extra vigilance to avoid fatigue-related illness.

Increased awareness of the symptoms of mononucleosis, knowledge of strategies for a safe return to sport activities and avoiding the factors which can prolong or spread the disease must be part of these recommendations, that are to be directed to athletes, coaches, general practitioners and physicians expert in sport medicine (14).

Riassunto

Rischio di mononucleosi infettiva tra i nuotatori agonisti: studio cross-sectional

Introduzione. Il rischio di mononucleosi infettiva tra gli atleti agonisti è molto dibattuto. Alcuni autori riportano un aumentato rischio di mononucleosi tra gli sportivi, in relazione alla frequenza di strutture chiuse, in cui sussiste un rischio aumentato di trasmissione di patogeni respiratori; anche l'overtraining è stato studiato come possibile fattore di rischio.

Disegno dello studio. Studio cross-sectional in un gruppo di nuotatori di età compresa tra 11 e 14 anni del Centro Universitario Sportivo di Bari.

Metodi. 40 nuotatori agonisti sono stati intervistati da personale sanitario al termine degli allenamenti; sono stati analizzati dati relativi a caratteristiche demografiche, abitudini personali, frequenza degli allenamenti e diagnosi di mononucleosi.

Risultati. L'incidenza life-time della mononucleosi è risultata pari al 40%; l'analisi multivariata ha mostrato una associazione statisticamente significativa tra mononucleosi e utilizzo promiscuo di borracce (aOR=8.2; 95% CI=1.4-49.2; z=2.32; p=0.021), mentre i soggetti con diagnosi di mononucleosi avevano una maggiore durata media degli allenamenti rispetto ai soggetti che non riportavano la malattia.

Conclusioni. Sono necessari studi multicentrici per definire in dettaglio l'epidemiologia della mononucleosi tra gli sportivi e per formulare appropriate raccomandazioni per la prevenzione di questa malattia.

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