



Stadiums as Possible Hot Spots for COVID-19 Spread

Arman Hassanzadeh-Rad^{1,*} and Farzin Halabchi^{id}²

¹Department of Nuclear Medicine, Sina Hospital, Tehran University of Medical Sciences, Tehran, Iran

²Sports Medicine Research Center, Neuroscience Institute, Tehran University of Medical Sciences, Tehran, Iran

*Corresponding author: Department of Nuclear Medicine, Sina Hospital, Tehran University of Medical Sciences, Tehran, Iran. Email: a-hassanzadeh@sina.tums.ac.ir

Received 2020 March 29; Revised 2020 April 01; Accepted 2020 April 01.

Keywords: Coronavirus, COVID-19, SARS-COV-2, Sports, Pandemics, Transmission

Dear Editor,

In December 2019, several cases of a highly contagious coronavirus infection were reported in Wuhan, Hubei, China (1). On February 11, 2020, the novel coronavirus and disease were named, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease (COVID-19) by the International Committee on Taxonomy of Viruses (ICTV) and World Health Organization (WHO), respectively (2, 3). The main symptoms of COVID-19 are fever, dry cough, and dyspnea (1). Progression of disease from upper respiratory tract infection to viral pneumonia is typical. It may lead to acute respiratory distress syndrome (ARDS), patient's endotracheal intubation at Intensive Care Units (ICUs), and death due to a combination of pneumonia, sepsis, and multi-organ dysfunction (4). The disease was characterized as a pandemic by WHO on March 11, 2020 (5).

The main routes for human to human transmission are respiratory droplets from infected patients, direct contact, aerosols, and fomite transmission (6), which are all probable in sports settings (7). Several strategies such as combined social distancing interventions (quarantine, school closure, and workplace distancing) have been advised (8) and recommended by WHO and many Centers for Disease Control (CDCs) to slow viral transmission as much as possible and flatten the epidemic curve and is widely applied in many countries and integrated into their national guidelines, including Iran. In order to have a valid social distancing strategy, maintaining adequate distance from others (at least 2 meters), no handshaking, hugging or kissing, limiting exposure time (by minimizing hours spent outside the home), and avoiding crowded places with the possibility of high viral loads are required.

Sports stadiums, before the announcement of epidemics in countries, when matches are held, and players, coaches, team staff members, and in particular fans gather

together in sports events can be considered as hot spots for COVID-19 spread. In an overcrowded stadium, none of the criteria for an effective social distancing are met (9). Fans are usually sitting and standing within centimeters from each other, hug and kiss each other in joy when their teams score goals, or win a set or the entire game repeatedly. Even when their favorite teams lose a game, they hug each other in grief and disappointment. What is more, usually a game with a considerable number of spectators (which mainly includes soccer, volleyball, basketball, and futsal in Iran as in many other countries worldwide) lasts for about 1 to 2 hours which is prolonged exposure time if people with SARS-COV-2 infection are present among participants.

A perfect example of how a sports stadium can turn into a hot spot for COVID-19 transmission happened during the match between Atalanta from Italy's Serie A and Valencia from Spain La Liga in the round of 16, first leg of UEFA Champion's League (UCL) on February 19, 2020, in San Siro Stadium in Milan, Italy, with an official attendance of 45792. This was a historic match for a small city of Bergamo with about 120000 population. Atalanta won the match 4-1 with lots of fans hugging each other in joy repeatedly for hours during and after the match and had to come back from Milan to Bergamo by buses, trains, and cars, which took them hours due to heavy traffic. As it is clear, non-adequate safe distancing, long exposure time to possible infected patients, and high viral loads were all present before, during, and after the match. Bergamo's Papa Giovanni XXIII Hospital intensive care director Luca Lorini said he believes those who attended Atlanta's 4-1 win over Valencia helped spread the outbreak: "I am sure that 40,000 people are hugging and kissing each other at a distance of one centimeter for four times, as Atalanta scored four times, well, those were an incredible accelerator for the infection" (10). Less than a week after the match, the first cases of COVID-19 were reported in the province of Berg-

amo, leading to more than 7000 people with a positive polymerase chain reaction (PCR) test for SARS-COV-2 and approximately 1000 deaths from the disease up to now. It is entirely rational to assume a considerable number of infected patients got the disease in or around the stadium or from close contact with fans participating in the soccer match.

What is the most reasonable decision considering sports matches during highly contagious epidemics like COVID-19? It seems great distancing by reducing the number of spectators and providing multiple entry. Exit doors and similar changes are not an ultimate solution, because of a still high probability of people getting infected by accidental contacts in the stadiums or during transportation to and from the stadiums. In this scenario, as in “playing behind the closed doors” scenario, there is still a considerable chance for the players, referees, coaching teams, medical teams, cameramen, and personnel of the stadium from security to facility management teams, to get infected. Postponement of all matches in all sports is the most reasonable answer so that matches can be held in a safe and joyful environment once the epidemic wave has passed. The decision to postpone Tokyo 2020 summer Olympic and Paralympic Games in Japan, which were supposed to be the largest mass gathering sport event in 2020, clearly shows top concerns about the health of all participants (11, 12).

What about matches which have been held during epidemics when national, continental, or international health authorities were unaware of the presence or extension of epidemics and erroneously thought holding a match with spectators was safe? Nothing much can be done for those who get the disease from other participants who are either asymptomatic and in their incubation period or have mild symptoms thought to be unrelated to highly contagious COVID-19 rather than usual treatment and quarantine strategies like all other infected patients. Nevertheless, what is applicable and has invaluable importance in this scenario is to actively track those infected patients with COVID-19 who have recently participated in a match, as a player and especially as a spectator. For players, it is easy to perform a PCR test for all teammates and team management of the infected player(s) team as well as members of the opponent team and make early diagnosis and treatment in those with positive PCR results. For audiences inside the stadiums, there should be obligatory rules for all federations in all countries to sell traceable electronic tickets for each seat. By doing this, if an infected patient with COVID-19 who has recently participated in a crowded sports match as a spectator is discovered in clinics or hospitals, it is feasible to track all seats in a certain distance from the infected patient’s seat (e.g., seats located in a radius of 2 meters from that seat) and by information

provided with electronic ticket systems, targeted PCR testing (instead of blind testing or no testing) is performed for other at-risk audiences whose seats were in close vicinity of that of the infected patient. It is to be reminded that the infected patient may not participate in a sports event soon after, but one of his/her close contacts may. So, information via electronic ticket systems and data registering should be performed for that close contact, and PCR tests should be done for the close contact and all those whose seats were within a certain distance from that person.

By doing this actively targeted screening, it is possible to increase the probability of finding PCR-positive athletes and spectators who are still asymptomatic or have mild and non-specific symptoms and treat them as COVID-19 patients either at home quarantine or after hospital admission based on WHO, CDCs, and national guidelines. Targeted screening in the stadiums which matches were held during epidemics helps early diagnosis of some asymptomatic or mildly symptomatic carriers of SARS-COV-2, leading to early treatment, decreased morbidity and mortality of individuals in the 1st, second or third circle of contacts with an infected patient and therefore reduce the speed of transmission chain significantly. This strategy is feasible in the current as well as probable future epidemics only if electronic ticket systems and data registering are applied in all stadiums and sports venues in all countries as an obligatory rule.

Footnotes

Conflict of Interests: None to be declared.

Funding/Support: None to be declared.

References

- Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;395(10223):497-506. doi: 10.1016/S0140-6736(20)30183-5. [PubMed: 31986264].
- Guarner J. Three emerging coronaviruses in two decades. *Am J Clin Pathol*. 2020;153(4):420-1. doi: 10.1093/ajcp/aaqaa029. [PubMed: 32053148]. [PubMed Central: PMC7109697].
- Coronaviridae Study Group of the International Committee on Taxonomy of Viruses. The species severe acute respiratory syndrome-related coronavirus: Classifying 2019-nCoV and naming it SARS-CoV-2. *Nat Microbiol*. 2020;5(4):536-44. doi: 10.1038/s41564-020-0695-z. [PubMed: 32123347].
- Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: A retrospective cohort study. *Lancet*. 2020;395(10229):1054-62. doi: 10.1016/S0140-6736(20)30566-3. [PubMed: 32171076].
- World Health Organization. *Coronavirus disease 2019 (COVID-19) situation report -51*. Geneva: WHO; 2020.
- Zhou D, Zhang P, Bao C, Zhang Y, Zhu N. Emerging understanding of etiology and epidemiology of the novel coronavirus

- (COVID-19) infection in Wuhan, China. *Preprints*. 2020. doi: [10.20944/preprints202002.0283.v1](https://doi.org/10.20944/preprints202002.0283.v1).
7. Ahmadinejad Z, Alijani N, Mansori S, Ziaee V. Common sports-related infections: A review on clinical pictures, management and time to return to sports. *Asian J Sports Med*. 2014;5(1):1-9. doi: [10.5812/asjasm.34174](https://doi.org/10.5812/asjasm.34174). [PubMed: [24868426](https://pubmed.ncbi.nlm.nih.gov/24868426/)]. [PubMed Central: [PMC4009082](https://pubmed.ncbi.nlm.nih.gov/PMC4009082/)].
 8. Koo JR, Cook AR, Park M, Sun Y, Sun H, Lim JT, et al. Interventions to mitigate early spread of SARS-CoV-2 in Singapore: A modelling study. *Lancet Infect Dis*. 2020. doi: [10.1016/s1473-3099\(20\)30162-6](https://doi.org/10.1016/s1473-3099(20)30162-6).
 9. Halabchi F, Ahmadinejad Z, Selk-Ghaffari M. COVID-19 epidemic: Exercise or not to exercise; that is the question!. *Asian J Sports Med*. 2020;11(1). doi: [10.5812/asjasm.102630](https://doi.org/10.5812/asjasm.102630).
 10. *Atalanta-Valencia Champions League clash accelerated coronavirus spread - chief doctor*. 2020. Available from: <https://www.espn.com/soccer/uefa-european-championship/story/4078701/atalanta-valencia-champions-league-clash-accelerated-coronavirus-spread-chief-doctor>.
 11. Gallego V, Nishiura H, Sah R, Rodriguez-Morales AJ. The COVID-19 outbreak and implications for the Tokyo 2020 Summer Olympic Games. *Travel Med Infect Dis*. 2020:101604. doi: [10.1016/j.tmaid.2020.101604](https://doi.org/10.1016/j.tmaid.2020.101604). [PubMed: [32112859](https://pubmed.ncbi.nlm.nih.gov/32112859/)].
 12. *Tokyo 2020 postponement task force launched*. 2020. Available from: <https://tokyo2020.org/en/news/tokyo-2020-postponement-task-force-launched>.