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Swimming Pool safety and prevention at the time of Covid-19: a consensus document from GSMS-SItI

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Parole chiave: Acque ricreative, SARS-CoV-2, Linee guida, Lockdown, Disinfezione

Abstract

Public health measures to cope with the Covid-19 pandemic, imposed also a shutdown of sports facilities and swimming pools. Safety issues related to recreational waters were emerging during the lockdown, rising concerns on how and when reopening pools and on how improve their management while SARS-CoV-2 is circulating in the population. The GSMS-SItI, Working Group on Movement Sciences for Health of the Italian Society of Hygiene Preventive Medicine and Public Health, discussed and summarized some indications for a suitable preventive approach. Several measures are highlighted, including social distancing, optimized water management, airflow and microclimatic parameters in the pool as well in the annexed rooms, verification of sanitation procedures. The GSMS-SItI underlines that prevention should be based on monitoring of the local epidemiological situation and on the constant collaboration with the local health authority and the national health service.

Introduction

The pandemic spreading of the Coronavirus disease 2019 (Covid-19) led to restrictive measures, including quarantine and a generalized lockdown in different countries (1, 2). New concerns have risen both on how to reopen socioeconomic activities and how to cohabit with the Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) (3, 4). Within this astonishing epidemiological scenery, specific public health issues relate to those preventive measures needed to operate and manage swimming facilities in the time of Covid-19. The question of a possible contamination and transmission of SARS-CoV-2 infection in swimming pools is a still debated key point, mainly due to the limited knowledge and unpredictable behavior shown by this novel coronavirus.

In order to address this issue a few concise statements were proposed by the Working Group on Movement Sciences for Health, of the Italian Society of Hygiene Preventive Medicine and Public Health (GSMS-SItI), that has been traditionally

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involved in studying public health issues related to recreational waters (5-7). This attention of GSMS-SItI on swimming pools arose not only from research interests in the field of water hygiene, but also as part of a strong educational commitment in university courses in sport sciences and adapted physical activity for health (8-10). Swimming pools, indeed, offer an extraordinary opportunity for prevention of non-communicable diseases through aerobic exercise and their safe reopening can contribute to decrease the levels of sedentary lifestyles induced by the extended lockdown measures (11-14). Therefore, swimming pools are not marginal but play an important social role, impacting on different activities including sport events, adapted physical activity for people of different ages and conditions, university education and health promotion. Watersports are very popular all over the world and, in Italy, they represent the most diffused sport (43,1%) between children below 10 years old, and one of the most practiced (21%) involving 4,265,000 people, almost 5000 public swimming pools, about 270,000 employees, with a turnover of 2,4 billion Euro (15-16).

Safe reopening and appropriate pool-management after the lockdown is a multifaceted theme for public health authorities, both at central level regarding policies and guidelines as well as at local level regarding permissions and surveillance. Moreover, swimming pools are heterogeneous and often complex structures, that may include also offices, cafeterias, gyms, outdoor and indoor spaces, hallways, spas, and different kind of locker rooms equipped with showers. Addressing the prevention of Covid-19 in these environments is a challenging task, that - if properly addressed - can lead to spread awareness and support a safe reopening of these and other sport facilities. The GSMS-SItI agreed to draw up a consensus document on Covid-19 prevention in swimming pools, in order to provide more a reference framework than a guideline.

GSMS-SItI consensus document on swimming pools in light of the Covid-19 pandemic

Given that physical activity in water represents a widespread practice in Italy, and that Covid-19 lockdown determined a prolonged interruption of sports and aquatic activities in pools, the GSMS-SItI emphasizes the need to address public health issues concerning a safe reopening of swimming pools to improve awareness on prevention and appropriate management of water environments for sport and recreational uses. Specifically, the GSMS-SItI highlights the following:

- The physical activity is a priority HEALTH PROTECTION FACTOR, and in particular physical activity in water represents an excellent opportunity for aerobic exercise and for primary, secondary, tertiary prevention (9).

- The impact of the lockdown on swimming facilities has not only interrupted sports activities in terms of competitions, social events, training of athletes or amateurs, but from an epidemiological perspective, it has also represented a RISK/DAMAGE FOR THE HEALTH OF THE POPULATION in terms of SERIOUS REDUCTION OF PHYSICAL ACTIVITY IN PEOPLE of all age groups and conditions: children, adults, pregnant women, the elderly, people with disabilities or who need adapted physical activity for rehabilitative or preventive needs (11-14).

- The oddity of the new coronavirus SARS-Cov-2 and the seriousness of the Covid-19 pandemic trend, impose to carefully evaluate all the public health issues that can allow a SAFE POOL REOPENING and a recovery of physical activities in water, both in terms of sporting activities (international,

national, local, paralympic, masters) and in terms of adapted physical activities for the general population (9, 10, 14, 17).

Therefore, the following is observed:

- Current knowledge on SARS-CoV-2 is limited and subjected to updates as research advances. Every consideration must be carefully examined, and each conclusion must be assessed in the light of possible updates from the scientific community or health authorities. However, based on what is presently available, it is already possible to define a framework of risks and a set of preventive actions, to date (18, 19).

- Sars-CoV-2 belongs to the Coronavirus family, which is one of the various species of viruses likely to be seasonal and causes of flu-like forms, which are very contagious and easily transmissible from person to person in different types of environments, but not in particular in swimming pools (20, 21).

- The spread of the Covid-19 pandemic affected different activities but no cases were reported from swimming pools or through water. Epidemiology confirms that the main transmission of the infection is by air, through the droplets of Flügge. The presence of the swimming pool itself would therefore not represent a particularly dangerous situation compared to other environments. Swimming facilities are therefore one of the many areas in which SARS-CoV-2 can transmit itself, but they do not constitute a specific risk, at least according to current epidemiological data (22-24).

- Prevention of Covid-19 transmission in the swimming pool must be strictly addressed, based on general guidelines as well as on the local specific context. These environments represent a minor part of a far wider and entirely new risk for modern societies. As such, it must be addressed by enhancing the correct management of swimming facilities in accordance with guidelines issued by public health institutions, respecting current regulations and acknowledging any update being provided by the health authorities in charge (23-27).

- The availability and enforcement of hygiene laws, and the long-established expertise of swimming pool operators in managing safety issues through conventional procedures, dedicated paths, regulations, technologies for disinfection and treatment of water, environmental sanitization and acquired good practices, leads to consider the swimming pools among the most prepared and safe facilities to reopen and recover sport and physical activities, assuring continuity to safety management. However, this rigorous effort concerns sport pools open to the public, as enforced by current laws. It would be very different the situation for those aquatic facilities used for ludic or other recreational purposes, for example as part of residential complexes or aimed at allowing people of different ages to sunbathe, refresh, play and socialize, often in overcrowded conditions. In these situations, aerobic physical exercise undertakes a secondary role and social distancing may become more difficult to enforce (9, 28, 29).

Based on the above, the GSMS-SItI suggests CONSIDERING A REOPENING OF THE POOLS for sport and physical activities and an IMPLEMENTATION of their HYGIENE MANAGEMENT, also in light of the following recommended proposals:

- Monitoring and constant alertness of the local EPIDEMIOLOGICAL SITUATION, considering a prompt adaptation of the swimming facilities to the general measures provided by the national and local authorities in regulating the reopening of the various activities.

- Definition or updating of a RISK ASSESSMENT DOCUMENT, drawn up based on general guidelines for prevention of Covid-19, as provided by Public Health

Officials and qualified institutions. It must be founded on Hazard Analysis and Critical Control Points approach and carefully individualized on the specific situation of each facility, considering the swimming pool structure, the activities carried out, all the annexed spaces including service areas and focusing on the changing rooms' hygiene;

- Acquisition and availability of appropriate PERSONAL PROTECTIVE EQUIPMENT, both for staff and users or guests, based on the general indications provided by the authorities responsible for occupational health and safety measures for prevention of Covid-19 (30).

- Preparation of a Covid-19 dedicated PREVENTION PLAN, both for ordinary situations as well as for the appropriate management of emergencies, including accidental releases of feces or biological fluids in pool water.

- Drafting an internal RULEBOOK for Covid-19 prevention, to inform users and staff and to enforce hygiene rules and interpersonal distancing measures.

- Given the exceptional nature of the situation caused by the Covid-19 pandemic, the classical behaviors of pool users are not anymore adequate and higher levels of awareness are required, for the protection of everyone's health. Enforcing hygiene rules could be accompanied by the consideration of forms of INTERNAL PENALTIES, in case of serious violations.

- Continually develop and adjust preventive measures by STEWARDSHIP and staff TRAINING, involving also information and education of athletes, coaches, personnel and swimming pool users.

Key operational measures include the following actions:

- Organize CONTROLS at the swimming pool admittance, both on users and staff, with EXPLICIT PROHIBITION of access to people with any Covid-19 symptoms, such as fever, cold, cough, possibly strengthening the monitoring at the entrance, even with appropriate measurement of body temperature.

- Encourage INTERPERSONAL DISTANCE both in the pool as in the adjoined or shared spaces, firstly reducing crowding. This can be achieved also through scheduled reservations, work shifts, one-way routes or other technical-structural methods that may be already available or that can be implemented in the swimming facility.

- Assure an excellent WATER MANAGEMENT and disinfection by setting the thresholds at the maximum values allowed by current laws, and not simply by achieving the minimum requirements; key points include optimal residual disinfection activity at optimal pH conditions, and optimal maintenance of water treatment devices. Water replenishment performs a fundamental function in diluting contaminants and improving the quality of the water in the pool. Water management should be addressed according to the WHO strategies for Water Safety Plans, which provide for a preventive and proactive rather than retrospective approach in managing health risks.

- Maintain Indoor AIR Quality and microclimatic conditions in indoor swimming pools and indoor spaces, aiming for maximum safety and quality values and not simply to the levels required for satisfying minimum requirements. Promote the best achievable air exchange and renewal in compliance with the microclimatic conditions, also trying to consider exchange flows from the outside avoiding internal circulations or ventilation from an indoor environment to another rather than supporting vertical air flows from top to bottom. The final aim is renewing the air and not simply allowing ventilation and recirculation. Technical issues for managing indoor air quality are usually reported also in official standards for the design, construction and management of sports facilities.

- Establish protocols and appropriate procedures for SANITIZING indoor areas, changing rooms, showers and adjoining spaces and furnishings. Perform cleaning and disinfection more frequently. Refer to the guidelines already available for the sanitization of environments for collective use because of the emergency due to COVID-19 epidemic. Cleaning and disinfection measures must be defined and scheduled, but also methods must be identified to periodically check not only their correct execution but also their effectiveness. Periodic measurements of microbiological parameters in air and surfaces can be considered to monitor the achievement of hygiene levels, especially in the initial steps after reopening or following accidental contaminations or suspected outbreaks. Especially after prolonged lockdown periods, reopening procedures require also a rigorous control of showers and sanitary water pipeline, to prevent Legionnaire's disease. All standard sanitation procedures must be maintained and implemented after long periods of closure of the pool.

- Implement strategies TO WARN users and staff to behave appropriately, also in spaces for mixed use, such as reception, administration offices, coffee bar, technical rooms, toilets, waiting rooms that may represent critical environments, which tend to crowd and may be at greater risk of contagion than the pool area itself. The swimming pool must be considered as a whole, with all its services and capacities. Guidelines and rules already enacted for other similar occupational or social activities may be easily transferred following the available protocols.

- Keep in mind the local epidemiological situation, staying in constant contact with the LOCAL HEALTH AUTHORITIES and accepting any temporary closure of the swimming pool as a prudent precaution.

Conclusions

Based on the above and in compliance with the general rules that the government and the central health authorities provided fora suitable resumption and safe maintenance of working activities, hereby the GSMS-SItI suggests a prompt reopening of swimming pools for sports use, considering them: among the workplaces and facilities for sport and physical activity i) where the possibility of managing safety and perform controls is highest, and which ii) can play a fundamental role in the prevention of other preexisting pandemics such as obesity, cancer or hypertension, which entail a very heavy load of morbidity and mortality for the population, in Italy as well as on a global scale. Therefore, operating pools and physical activity represent a social priority also in a One Health perspective. Intentionally, the list of the few and simple indications suggested by the GSMS-SItI was opened by a first initial point related to the evaluation of the epidemiological situation and closed by a final statement dedicated to the local health authorities. We are convinced that these are the headlights to follow to enter the safe harbor of well operated swimming pools, both during the circulation of SARS-CoV-2 and in a "post-Covid-19" time. In Italy, the active collaboration of the prevention departments plays a pivotal role at very local level as well as within the wider network of the National Health Service.

Discussion

This GSMS-SItI consensus starts with several premises and fundamental concepts to finally show a collaborative approach between Public Health Authority and swimming pool management. This teamwork is synergic but not exclusive and intends to involve all those people who participate in

the world of pool, from athletes to lifeguards, from guests to staff. It is based on awareness, empowerment and continuing education. Being a scientific and academic committee, the final aim was to provide a cultural and technical framework to approach the question by knowledge and references rather than listing operational measures, thresholds, or ranges for classical or novel parameters. Appropriate protocols and values, indeed, can be gathered from the general framework and statements, but final values and their official application tend to be provided by authorities in charge and stockholders, representing often a compromise between different needs on field more than absolute scientific evidences, e.g. the temperature ranges for the water in the pool or other threshold values that largely change from a country to another, such as the chlorine ranges. However, by discussing this topic, we can consider at least some practical issues.

First of all, the question of the water disinfection. The Italian Istituto Superiore di Sanità (National Health Institute) stated that there is no evidence that Covid-19 can be spread to humans through the use of swimming pools or whirlpools. Correct operation, maintenance and adequate disinfection of swimming pools and whirlpools ensures the inactivation of the SARS-CoV-2 virus (31-34). Likewise, also health authorities in other countries and CDC provided several considerations for public pools, hot tubs, and water playgrounds during Covid-19 (23). There is no evidence that the virus that causes COVID-19 can be spread through the water in pools and proper operation, maintenance and disinfection with chlorine should inactivate the virus in the water (32).

SARS-CoV-2 was detected in feces, but the question of water contaminations concerns not only the presence of the virus in the intestine and the possibility of its oral transmission though water, but also through other biological fluids as saliva or nasal secretions, that could be released in the water (35, 36). So far, no laboratory test on SARS-CoV-2 inactivation at conditions present in swimming pools are available yet, but several studies acquired information from other Coronaviruses in waters. SARS-CoV-1 was completely inactivated in wastewaters by chlorine (10 mg/L for 10 minutes with a concentration of free residual chlorine of 0,5 mg/L or with chlorine dioxide 40 mg/L for 30 minutes with a residual free chlorine concentration of 2,19 mg/L) (32, 37). Even if the main transmission route is through droplets, the whole of these observations would recommend increasing the levels of chlorine bringing the pool operation at the highest thresholds allowed by the current regulations. Moreover, an update of laws in force should be considered by the central health authorities in the different countries, accepting higher disinfection activities at least for the initial phase of swimming pool reopening. Physical distancing in water can represent an additional protective measure. It can be reached allowing a lower number of swimmers in the pool and surveilling their reciprocal distancing along the pool lanes. Planning in advance the attendance by online reservations can support a better distribution of swimmers along the day, in smaller groups and shorter rounds. Structural divisions on the body of water were also considered, as well as measures to define the square meters allowed for each swimmer, starting from assuring a physical distancing of at least 2 meters. Even the use of protective devices as full-face snorkel masks has been considered in order to protect both the swimmer from exposure to contaminated waters as well as other swimmers by reducing the direct elimination of fluids and viral particles in the water; following an approach already experimented in healthcare workers (38).

A further issue is related to changing rooms. Sanitation measures must be performed frequently after each controlled

access by swimmers. Cleaning and disinfection procedures must be carried out, but also verified. Surveillance may consider periodic monitoring by microbiological test, by fast methods for performing internal controls or by the support of an external laboratory. Whatever the chosen strategy, a check that cleaning has taken place should be considered. Regarding crowding and access to changing rooms, shifts should be assured to enforce social distancing, based on the number of users, space availability, number of showers or space between lockers. Air replacement represents a key issue to increase the dilution factor, but microclimatic conditions must first ensure thermal comfort conditions and healthy indoor environments (39). Air flows should always follow dynamics to remove contaminants from the indoor environment, supporting the push down of droplets rather than moving air flows from an area to another of the changing room (40).

Finally, several issues should be considered in the first phases of the reopening. Since to cope with Covid-19 prevention is a new and complex process, the manager may define a dedicated task force to organize the preventive measures and monitor their implementation. This local team can collaborate in defining best hygiene practices, preparing or updating the risk assessment document and the prevention plan, as well as handling emergencies with preparedness. Then, a special care has to be considered when reopening after the lockdown, to verify not only the water plant of the pool for the presence of biofilm but also the shower pipeline and the water heating system reservoirs for the possible presence of Legionella, due to the long period of inactivity and the following stagnation. Classical remediation procedures can be applied following available guidelines (41). However, all these and other questions cannot always find an answer in the personnel of the swimming pool and may need the interaction with different skills, especially in the field of hygiene and public health. This teamwork needs an effective collaboration between managers in charge of the swimming pools and the local health authorities. Safely operating pools and Covid-19 prevention require technical expertise, knowledge of the aquatic facility, and the support of the public service. With all the limitations and curtailments suffered in recent decades, the Italian National Health Service has proven to maintain its steady sailing route even in the odd storm generated by SARS-CoV-2. Strengthening the already available hygiene skills and public health tasks of the local health authorities, will promote an appropriate recovery after the lockdown. Different social and occupational activities, including sport and physical activity, all need to restart in a progressive way, safer and better, including swimming pools at the time of Covid-19.

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Riassunto

Sicurezza e prevenzione in piscina ai tempi del Covid-19: linee di indirizzo in un consensus document dal GSMS-SItI

Le misure di sanità pubblica adottate per contrastare la diffusione della pandemia da Covid-19 hanno imposto la chiusura anche di impianti sportivi e piscine ad uso natatorio. Il lockdown ha aperto nuove problematiche sulla sicurezza di acque ad uso ricreativo e sollevato perplessità sui tempi e modalità con cui riaprire le piscine, nonché sul miglioramento della loro gestione in concomitanza con il permanere della circolazione di SARS-CoV-2 nella popolazione. Il GSMS-SItI, Gruppo di Lavoro Scienze Motorie per la Salute della Società Italiana di Igiene, Medicina Preventiva e Sanità Pubblica, ha riassunto alcune considerazioni per aiutare

ad affrontare correttamente il problema e migliorare le condizioni di sicurezza. Diverse misure di prevenzione vengono messe in evidenza, tra cui il distanziamento sociale, la gestione ottimale dell'acqua e anche dell'aria sia sulla vasca che nei locali annessi, e la verifica delle procedure di sanificazione. Il GSMS-SItI sottolinea come la prevenzione dovrebbe innanzitutto fondarsi sulla considerazione della situazione epidemiologica e sulla collaborazione con i dipartimenti di prevenzione ed il servizio sanitario nazionale.

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