Review Article

Global Implications of COVID-19 Pandemic on Adults' Lifestyle Behavior: The Invisible Pandemic of Noncommunicable Disease

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Abstract

COVID-19 pandemic, with its subsequent lockdown and mobility restriction is a public health emergency that has obliged substantial modifications in daily routines and lifestyle of people worldwide. The drastic measures of social isolation and home confinement has impacted to a great extent the physical and psychological health. The resultant abrupt in lifestyle-related behavior such as physical inactivity, unhealthy dietary habit, sleep disturbance, stress, tobacco use, and alcohol intake, is directly linked to the rising global burden of non-communicable disease. This review aims at gaining a rich and extensive understanding of the potential negative impact triggered by COVID-19 on lifestyle-related behaviors that will influence long-term physical and mental wellbeing. Electronic database search was conducted on PubMed, ScienceDirect, Google Scholar, and Scopus from January 1, 2020 to March 15, 2021. Data related to COVID-19 impact on lifestyle habits were extracted from these studies. Articles were included if meeting the inclusion criteria (i.e., assessed the impact of COVID-19 on physical inactivity and sedentary behavior, dietary habits, sleep, mental health, vitamin D, and substance use among adults. Further search was conducted to address these behavioral changes among athletes. While physical isolation is a necessary public health measure to protect the population, outcomes of this review indicate that in light of adverse lifestyle changes brought by the pandemic, noncommunicable disease remains a critical concern. Hence, adopting healthy lifestyle behavior is essentially important especially during the current time to boost immunity and reduce the risk of COVID-19 infection. Recognizing the pandemic collateral effects offers a forward-looking perspective to guide the government and health authorities in planning prevention and control programs that focus on resilient and sustainable behavioral change.

Keywords: *Athletes, dietary habit, mental health, physical activity, public health, sedentary behavior, sleep, substance use*

Introduction

The emergence of the novel coronavirus 2019 (COVID-19) has created a unique challenge to the global public health. The virus was first discovered in Wuhan, China in November of 2020, and rapidly, declared on 30 January 2020 by the World Health Organization (WHO) as a public health emergency of international concern.[1] Transmission of COVID-19 may occur through direct, indirect, or close contact with infected people via infected secretion or respiratory droplets.[2] Containment efforts and mitigation strategies such as physical distancing, quarantine, wearing mask, and enforced lockdown were imposed across the globe to limit the spread of the disease.[3] On the downside, the lockdown has had a substantial negative impact on several aspects of our lives particularly on social and psychological wellbeing.[3] The closure of nonessential business and government facilities such as recreation and fitness centers, outdoor parks, theatres, restaurants, and the subsequent limitation of leisure opportunities could reasonably exacerbate the physical and mental health outcomes.[3]

According to multiple recent studies, the adverse effects of COVID-19 restrictions have extended beyond social participation to influence life satisfaction, emotional wellbeing, employment status, and sleep quality as well.[4-6] Aside from physical sickness brought by the pandemic, the negative long-term effects of unhealthy lifestyle habits such as physical inactivity, sedentary behavior, sleep disruption, and mental health constrains remain important aspect to be explored in depth.[4,5] Unhealthy lifestyle synonymous with an

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increased risk of NCDs, a major public health problem and a leading cause of mortality worldwide.[7] According to WHO, over 80% of premature NCDs death is attributed to four major diseases, namely, cardiovascular diseases, cancers, respiratory diseases, and diabetes, jeopardizing the progress toward the 2030 Agenda for Sustainable Development.[7] Exposure to NCDs risk factors increases people's vulnerability to COVID-19 infection and the likelihood of worse outcomes.[8] A recent metaanalysis investigated the prevalence of underlying diseases among patients infected with COVID-19. Hypertension (21.1%) and diabetes (9.7%) were found to be the most common comorbidities, followed by cardiovascular diseases (8.4%) and respiratory system disease (1.5%). Patients with cardiovascular disease and hypertension were 3.4 and 2.4 times more likely to have severe outcomes, respectively.[8] Furthermore, disruption of health services caused by COVID-19 such as screening, referral, rehabilitation is particularly problematic for individuals with NCDs, who need regular long-term care.[9]

The high prevalence of lifestyle-related diseases, and their risk factors that compromise the immune system have raised an alarming concern worldwide especially at this difficult time. Therefore, it is equally important to explore the collateral and long-term effects of the COVID-19 and highlights the need of a robust, agile, and culturally relevant health promotion and prevention strategies accordingly. It is an opportunity to take a more holistic approach to health and well-being and invest in health systems that will assist the community to lead and maintain a better health behavior during and after pandemic.

Thus, this review aims at gaining a rich and extensive understanding of the potential negative impacts triggered by COVID-19 on lifestyle-related behavior attributed to long-term physical and mental wellbeing. The generated database should provide guidance into health prevention and promotion program planning, with special considerations to people with NCDs.

Methodology

Search strategy

We reviewed the literature concerning the impact of COVID-19 pandemic on several lifestyle behaviors. Electronic search was conducted for studies from January 1, 2020 to March 15, 2021 using the following electronic databases: PubMed, ScienceDirect, Google Scholar, and Scopus. Keywords either single or blended were used: "COVID-19" OR "confinement" OR "social distancing" OR "lifestyle" OR "sleep" OR "physical activity" OR "sedentary behaviour" OR "diet" OR "mental health" OR "depression" OR "anxiety" OR "stress" "vitamin D" OR "substance use" OR "smoking" OR "alcohol". Search of these keywords was then carried out for athletes specifically being as a special population group. Search of related references from retrieved articles was performed. We imposed no language or other restrictions on any of the searches.

Selection process

All articles that have assessed the relationship between COVID-19 and changes in lifestyle behaviors among adult population (i.e. aged 18 years and above) were included in this review. Articles were screened according to the inclusion criteria for the study to ensure suitability/eligibility, including the impact of COVID-19 on[1] physical inactivity and sedentary behavior[2]; dietary habits[3]; sleep[4]; mental health[5]; vitamin D, and[6] substance use. Further search of articles related to athletes was conducted to outline the impact of the pandemic on their lifestyle-related behaviors. Articles were excluded from the review if they examined adults with medical conditions/disabilities or children/adolescent age group.

Data collection process

All potentially relevant full texts were screened by two authors (S.M, I.D) independently of one another. Disagreements between reviewers were resolved by consensus or by the decision of a third independent reviewer (V.B). Articles meeting the inclusion criteria were retrieved for this review and relevant contents were allocated into six subsections, including: (i) physical activity and sedentary behavior, (ii) dietary habits, (iii) sleep, (iv) vitamin D, (v) mental health, and (vi) substance use. Articles related to athletes and their lifestyle changes (the six above categories) due to COVID-19 were reviewed individually and summarized as a separate section.

Results

Physical activity and sedentary behavior

Lockdown and mobility restriction have impacted the ability to be physically active. COVID-19 home confinement resulted in a decline in all levels of physical activity and a 28% rise in daily sitting time.[6] Physical activity is an essential part of maintaining a healthy lifestyle and preventing disease. Indeed, it is well known that physical inactivity raises the risk of a variety of chronic diseases, including hypertension, coronary heart disease, stroke, and diabetes, as well as depression and the risk of falling.[10] Obesity and the lack of cardiorespiratory fitness have been identified as risk factors for experiencing more severe COVID-19 symptoms and related complications.[11] It is evident that physical activity increases the circulation of immunoglobulins, cytokines and macrophages, which play an important role in stimulating the immune system. Regular exercise can also help to boost immunity against viral infections, especially those of the respiratory tract.[12] According to the WHO, the majority of health benefits in adults aged 18 to 64 years occur when they engage in at least 150 min of moderate physical activity per week, >75 min of vigorous-intensity physical activity

per week, or an equivalent combination of both. Any waking activity with an energy consumption of less than 1.5 metabolic equivalents (METs) while in a sitting or reclining position is categorized as sedentary.[13] According to a study performed among the Italian general population between January and March 2020 using smart technology devices, the steps count during the lockdown decreased from 8,284 ± 4,390 to 3,294 ± 3,994 steps ($P < 0.001$), while mean peak heart rate decreased from 61.3 ± 18.2 to 55.9 ± 17.3% ($P < 0.001$).[14] A qualitative research looked at the experiences of 22 adults who were frequent gym goers prior to COVID-19 pandemic but remained at home during the national lockdown. The findings showed that the participants had a pessimistic situational experience and a lack of enthusiasm for fitness exercise during the initial process of lockdown. Concerns about mental health and an overreliance on social media as a way to spend free time were also observed. However, there was a steady improvement in positive self-perception and encouragement to continue home-based fitness exercises and reduce reliance on gym and fitness equipment.[15] During the COVID-19 pandemic in Bangladesh, a survey of 2,028 participants found that 37.9%, 38.3%, and 23.9% were physically inactive, moderately active, and had high levels of physical activity, respectively. Nearly 21% of those who were physically inactive had a high level of sedentary behavior (>8 h per day). Physical inactivity was found to be substantially higher among young adults (42.5%) compared with participants older than 25 year (27.7%).[16] Several factors were recognized as barriers to physical activity, including significant change in sleeping patterns, unexplained anhedonia, mental fatigue, and general feeling of fear, anxiety, or stress during the pandemic. In addition, there was a lack of motivation to initiate alternative ways to continue fitness exercise, due to lack of workout partner and the gym atmosphere, which resulted in a sense of isolation.[17]

Physical activity is extremely important during this difficult time, particularly for older adults, and people living with NCDs. Beside its health benefits, physical activity conveys a significant support in emotional resilience and social inclusion. Therefore, planning programs to enhance home-based activities, online-fitness resources, taking virtual fitness classes, and setting exercise goals could provide opportunities during the pandemic.

Dietary habits

Nutrition is a public health priority at any time in one's life, but particularly during a pandemic, when developing a strong immune system to prevent infection is critical. A healthy balanced diet helps provides the body with essential nutrients and adequate calories that protect against all forms of malnutrition and chronic diseases such as diabetes mellitus and heart disease. A healthy diet can also protect the community from an excessive coronavirus-induced inflammatory response.[18]

Globally, the COVID-19 pandemic and the risk of infection through food has triggered concern and anxiety about food insecurity.[19] People started to panic and began to overstock food supplies during the beginning of lockdown.[20] Individuals' eating habits and dietary consumption have been affected by limited access to food due to restricted shop hours and insufficient supply. There has been a rise in the consumption of fast foods and processed foods, as well as a decrease in the consumption of fruits and vegetables, resulting in weight gain and malnutrition.[21] High intake of fruits and vegetables has been linked to a rise in antioxidants, a known correlate to healthier weight and disease prevention.[22] Social isolation as a means of quarantine has been associated with eating disorders. For instance, large quantities of food stored at home has stimulated binge eating disorder in at-risk individuals.[23] Moreover, the limited access to psychiatric health services has exerted further challenge for individuals with pre-existing eating disorders, resulting in an increased severity and regression of condition.[23] Furthermore, anxiety and uncertainty provoked by COVID-19 pandemic has led people to adopt stress eating behavior to suppress negative emotions rather than physical hunger cues.[23] While some countries, such as Poland and Italy, have reported negative dietary habits during quarantine, COVID-19 confinement has also contributed to healthier dietary behaviors in others, such as India and Saudi Arabia, where 85.6% reported eating home-cooked meals every day, compared with just 35.6% before the pandemic. Nevertheless, there has been a marked deterioration in the quality of food consumed, with carbohydrate and fat consumption rising by 21% and 13%, respectively.[24] On the other hand, a study conducted in Saudi Arabia to determine the impact of extended lockdown on weight changes found that 40% of participants reported increased food intake while 45% reported increased snacking. Eighty percent of those who gained weight specified that home-cooked meals were more largely consumed compared with prior lockdown. Cooking methods, form, quantity, and quality of ingredients used all play a pivotal role in whether eating home-cooked food is considered a healthy dietary habit.[25] In line with previous study, Scarmozzino *et al*.,[26] have revealed in their study that 46.1% of Italians reported eating more during their confinement, and 19.5% gained weight. There has also been an increase in the consumption of "comfort foods," especially chocolate, ice cream, and sweets (42.5%) and salty snacks (23.5%).[26,27]

Nutritional transition leading to unhealthy dietary habit contribute to the occurrence of metabolic syndrome – abdominal obesity, hypertension, dyslipidemia, and disturbed metabolism of glucose or insulin, which in turn increases the risk of developing NCDs. The benefit of a healthy diet is not merely confined to weight control, but extend to influence sleep, fighting off-diseases, risk of cardiovascular diseases and positive mental health. Therefore, it is important to consider one's needs and

assess foods availability at home to avoid over-purchasing and overconsumption during home stay. Moreover, prioritize using fresh products especially fruits, vegetables and reduced-fat dairy products, over canned, processed food, even if you consider freezing option that would carry similar nutritional values. Use the opportunity of being home and prepare home-cooked meal, taking into consideration the method, ingredients, and portion consumed. Furthermore, engagement in some form of fasting or caloric restriction, could stimulate dietary control especially when physically inactive.

Sleep

Sleep is important for human health, for which it enhances neurobehavioral, cognitive, and safety-related functions such as memory consolidation, nociception, appetite control, as well as immune and hormonal functions.[28-31] According to the American Academy of Sleep Medicine (AASM) and the Sleep Research Society, the amount of sleep essential for optimum health in adults is considered to be seven or more hours per night on a regular basis.[32] COVID-19-related concerns and frequent viewing of crisis news (e.g. increase in human death toll) triggered tension in the general population, resulting in insomnia.[33] In the United Kingdom, Carbonell *et al*.[34] studied the effect of the pandemic on sleep pattern and found that 69.4% of participants experienced a shift in sleep schedule during the pandemic, 45.6% experienced hypersomnia, 7.4% used sleep drugs, and 31.3% recorded sleep restriction of less than 6 hours per day. Participants who were older and had a higher BMI showed more vulnerability/disability as well as a negative effect on their mental health.[34] According to a survey in Nepal about the effect of the COVID-19 pandemic on sleep quality, moderate insomnia was notably increased from 2.9 to 16.5% before and during lockdown.[34] The study also revealed correlation between difficulty falling asleep, difficulty sleeping continuously, and impaired quality of life both before and during lockdown.[35] A study conducted by AASM on 2007 adults illustrated that COVID-19 pandemic has impacted sleep quality in 33% of Americans, ability to fall asleep in 30%, ability to stay asleep in 25%, and duration of sleep in 28%. Female and the age group (35-44) year were amongst the most vulnerable groups.[36] Researches indicate that insufficient sleep and/or mistimed sleep is a major risk factor for obesity, depression and NCDS such as CVD and T2DM. Obesity is linked to obstructive sleep apnea, a known risk factor for cardiovascular disease.[37] Moreover, sleep duration and suboptimal sleep quality have emerged as predictors of levels of Hemoglobin A1C, an important marker of blood sugar control.[37]

Sleep quality and duration are a key factor to maintain a healthy weight and subsequently reduce the risk of obesity-related obstructive sleep apnea and development of NCDs such as cardiovascular disease and diabetes. Adopting multiple methods for sleep improvement may enhance better outcomes. These include sleeping at the same time daily, avoiding late napping, avoiding heavy meals and caffeine/alcohol intake late in the day, preparing the bedroom environment, and turning off TV or any screen at least an hour before bed. People with NCDs are encouraged to prioritize their sleep quality and pattern, and if necessary, use supplement bedtime rituals.

Mental health

COVID-19-related fatalities, financial distress, and unprecedented social contact restrictions have all had a profound impact on people's mental health.[38] While evidence indicates that social distancing measures are successful in preventing the spread of the virus,[39] they are likely to have negative psychological, social, and physical health consequences, especially among vulnerable populations such as older adults with chronic illnesses and people with low socioeconomic status.[40] Fear of being infected by a potentially lethal virus, which source, nature, and course remain unknown, in addition to its rapid spread, has been shown to affect psychological well-being.[41,42] The pandemic revealed an increase in symptoms of stress, depression and anxiety among general population. In addition, suicidal cases were potentially linked to the mental implications of COVID-19 and have been reported in some countries like South Korea[43] and India.[44] Reynolds *et al*.[45] evaluated a cohort of quarantined people during the 2003 SARS outbreak in Canada for their perception of challenges, compliance with step counts, and overall psychological effect of the quarantine experience. Results indicate that 22.4% of participants reported anxiety, 18.2% nervousness, 18% sadness, and 10% guilt.[38] A recent systematic review of 19 articles indicated that the prevalence of depressive and anxiety symptoms ranged from 14.6 to 48.3% and 6.33 to 50.9%, respectively.[46] Several predictive factors were identified including female gender, age ≤40 years, students, lower educational-level, poor self-rated health, being divorced/widowed, being single, lower income, worry about being infected, unemployment, not having a child, history of mental stress or medical problems, and recurrent exposure to COVID-19-related news.[46,47] In brief, the current pandemic has wreaked havoc on culture, health-care system and economy, for this, further attention should be devoted to public mental wellbeing as to assist people getting through this difficult time. Severe diseases, bereavement, social alienation, and unemployment are amongst the prevalent stressors that people face. Poor mental health or mental disorders often coexist with other NCDs or indirectly exacerbate NCDs modifiable-related risk factors such as physical inactivity leading to obesity, tobacco use, or lack of energy or motivation. During this current time of crisis, it is important to remember that taking care of mental health is as important as looking after physical health. It is normal to acknowledge some sort of anxiety and stress; however, individuals should use self-assistance tools combined with social and medical support to overcome this difficult time.

For instance, taking breaks from watching TV, reading, or listening to news stories, in addition to, maintaining healthy diets, regular exercising, sufficient sleep, collectively will lead to better mental outcome. Moreover, commitment to imposed precautionary measures such as COVID-19 vaccination, wearing mask, social distancing will further reduce stress-related to fear, that is principally important in people with NCDs.

Vitamin D

Nutritional health is a significant factor in warding off viral infections.[48] Vitamin D is an essential nutrient that humans obtain through sunlight exposure, diet, or dietary supplements. Vitamin D obtained from food is mainly found in fatty fish, fortified grains, and dairy products.[49,50] Vitamin D plays an important role in bone metabolism, muscle function, viral infection prevention, cardiovascular health, and overall well-being. Solar ultraviolet B radiation converts 7-Dehydrocholesterol in the skin to pre-vitamin D3 and subsequently to vitamin D3. Skin pigmentation, sun safety, latitude, age, amount of ultraviolet radiation exposure, and clothing coverage all of which influence the ability to form this pro-hormone, and any of these factors may have a major impact on vitamin D levels.[49] Home confinement and movement restriction has led to insufficient sun exposure, changes in quantity and quality of diet with more tendency to non-nutritional food, all of which, have resulted in rising the likelihood of vitamin D deficiency. Vitamin D plays a critical and complex role in maintaining the immune system function as evident by several studies.[48,49] It is believed that vitamin D has effects on endocrine system, cardiovascular system, neuropsychological functioning, neuromuscular performance, and a potent antioxidant protecting against carcinogenesis. Vitamin D deficiency has been correlated to infection susceptibility, particularly respiratory infections.[51,52] Several lines of evidence have linked immune dysregulation triggered by vitamin D deficiency with increased susceptibility to COVID-19. Thus, it is important more than any time before to sustain healthy behavioral habits such going for a short walk, obtain sufficient sun exposure, consuming food rich in vitamin D, and/or taking supplementary medications. COVID-19 infection has been related to several factors including arterial hypertension, obesity, male sex, advanced age, residence at high altitude with inadequate sun exposure, coagulopathy, and immune dysfunction.[53] Vitamin D supplementation has also been suggested as a potential way to enhance health outcomes in COVID-19 patients.[54] A variety of studies have shown that beside the beneficial effects of vitamin D on skeletal health and infectious disease, vitamin D deficiency has been linked to exacerbation of various NCDs, notably cardiovascular diseases and diabetes, as well as their predisposing factors, such as obesity and insulin resistance.[55,56] Beside the benefits of vitamin D in skeletal health and infectious disease protection, obesity and insulin resistance brought by vitamin D deficiency, may exerts a synergistic challenge added to the burden of NCDs. People in quarantine or self-isolation should, therefore, reasonably expose themselves to the sunlight daily (if feasible), and, in any case, consider the intake of vitamin D, either dietary or supplement. People with NCDs should work with their doctor to track their vitamin D levels as much as possible.

Substance use

In the context of COVID-19 pandemic, substance use remains a public health priority. Tobacco smoking and high-risk alcohol consumption are among the leading causes of NCDs and premature death worldwide.[5] The COVID-19 pandemic, its associated health risks, and its constraints on social activity may influence smoking and drinking in several ways. It may have the potential to reduce the prevalence of smoking and high-risk drinking by providing an educational opportunity regarding the health hazards associated with tobacco and alcohol use and encouraging people to make healthier lifestyle changes. Social distancing and stay-at-home constraints interrupt everyday habits, which may minimize or eliminate normal smoking or alcohol cues, making it easier to alter these behaviors.[57] Social smokers and drinkers may be less likely to engage in such behaviors at home. Smokers who are unable (e.g., because of rules set by a landlord or other family member) or unwilling (e.g., due to having children in the household) to smoke inside the house, may benefit from home confinement in smoking cessation. However, there are reasons to believe that lockdown may lead to increase in the prevalence of smoking and alcohol intake and make quit attempts less of a priority. Social isolation, unemployment, finances, care obligations, and fears of contracting or becoming sick from the virus are all causing people to be more stressed than normal.[41] Stress plays a significant role in the onset and persistence of substance abuse.[57] Many smokers mistakenly believe that smoking relieves tension and use it as a coping mechanism when they are under a lot of pressure.[58] Previous research on the effects of disasters like terrorist attacks, natural disasters, and the COVID-19 outbreak has found higher rates of addictive habits like alcohol use, smoking, and uncontrolled internet usage.[59,60] Tobacco use is a potential cause for the four major NCDs, putting people with these diseases at a higher risk of developing chronic infection if infected with COVID-19.[56] A research in Turkey evaluated the impact of COVID-19 pandemic on smoking addiction found that 53.6 percent of participants continued smoking at the same level during the pandemic, while individuals with low addiction level before the pandemic have increased to 17.6 and 29.4% at moderate and high levels during the pandemic, respectively.[61] In contrary, a study in China found that the total rate of alcohol and smoking have increased only slightly during the COVID-19 pandemic from 31.3 to 32.7% for drinking and 12.8% to 13.6% for smoking. However, the rate of addictive behaviors and relapse among

ex- smoker and ex-drinker has increased substantially at 18.8% and 25.3%, respectively.[62] In England, a cross-sectional survey involving 20,558 adults (≥16 years of age) found that COVID-19 lockdown was not associated with a significant change in smoking prevalence (15.9 before- to 17.0% after- lockdown), instead it was associated with increases in the rate of quit attempts (29.1 to 39.6%) and cessation (4.1 to 8.8%) among past-year smokers. Lockdown, on the other hand, was linked to a rise in the prevalence of high-risk drinking (25.1% to 38.3%) and alcohol reduction attempts by high-risk drinkers (15.3% to 28.5%).[62] Substance use either smoking or alcohol intake is among the four main modifiable lifestyle risk factors for NCDs especially respiratory disease and cancer, and a major contributor to mental health outcomes particularly among vulnerable population. Efforts should be directed at earlier age and tackle primordial prevention, perhaps at school, to reduce the emergence of these risk behaviors and associated mortality.

Special considerations for athletes

Athletes are no exception for the reach of negative consequences of the current pandemic. Lifestyle, especially sports, carry limitations in its daily practices by specific modality and to a different extent (***e.g.*** team sports, sports taking place in indoor facilities with close contact between competitors, athletics, etc.).[6,18] Therefore, trying to stay fit (avoiding deconditioning and complying with intensity and volume of training) during confinement while preserving sports gestures (specific movements to each sport), keeping a healthy diet, preventing vitamin D insufficiency, avoiding any sleep pattern disturbance, and deriving psychodynamic aspects that can influence immune system and human health should be a priority for high-performance athletes. In terms of nutrition, athletes experienced unhealthy eating patterns like overeating snacks due to boredom in isolation.[18] Adequate sleep is essential to retain memory, learn new skills, improve performance and overall mood among athletes.[29-31] In addition, sleep is closely correlated with cognitive processing such as decision making and adapting new situation, which is of profound importance in athletes.[29,30] Sleep deprivation also increases irritability and risk of anxiety and depression.[31] Given the fact that exercise or training levels is likely to drop significantly during this pandemic. Yousfi *et al*.[18] have proposed several recommendations for athletes that include changing meal patterns through fasting or caloric restriction and to avoid weight gain while considering the fulfilment of essential macronutrients, especially, Vitamin D that has been suggested to play a role in reducing the risk of COVID-19.[18] COVID-19 pandemic has triggered the first worldwide disruption to the sporting calendar with the majority of sporting events coming to a standstill or being played behind closed doors (***i.e.*** without spectators).[63] For instance, the Tokyo Summer Olympics and Paralympics 2020 has been rescheduled to July 2021[64] and the Union of European Football Associations has postponed its 2020 Champions League matches as a preventive measure to avoid the spread of the virus due to some professional players tested positive.[64] Accordingly, athletes experienced mental health symptoms and disorders at rates equivalent to or exceeding those of the general population. Cancellation or postponement of many local or international events, including sports events, had huge implications on elite and/or professional athletes' mental health as some trains in specific cycles with one goal in mind - the upcoming Tokyo Olympics 2021. For some, it could be the last chance (due to age or sport-specific conditions) to achieve a medal.[65,66] In addition to sports event rescheduling, training at home creates another mental health disorder for athletes. Given the global spread of COVID-19, a football match of about 20,000 spectators in the same stadium has been held in Qatar under tightly regulated preventative measures by the end of 2020. This initiative instilled confidence in athletes and fans alike for upcoming major sporting events.[63] Returning to normalcy, on the other hand, is quite a long way off. As a result, athletes were required to undergo a COVID-19 reverse transcription polymerase chain reaction test three and six days prior to the competition (and weekly in long tournaments) in accordance with the British Journal of Sports Medicine's guidelines,[67] which increased anxiety and stress levels in athletes. However, the launch of coronavirus vaccination campaign with provision of vaccination passports gives a promising "hope and courage" to Olympics and all sport events by ensuring games are not postponed and undertaken with more safety measures.

Conclusions

The present review has examined the impact of COVID-19 pandemic on major lifestyle behaviors that significantly contribute to the burden of NCDs in the general population as well as on several new lifestyle-related stressors for elite athletes. Preventive measures to control the pandemic such as physical/social distancing, lockdowns, self-isolation, and quarantine go beyond the individual and community at national and international levels. Disruption of essential healthcare services coupled with increased exposure to NCDs-related behavioral risk factors, driven by the precautionary measures against COVID-19 pandemic, have exerted a serious risk among the entire population in general and individuals with NCDs in particular. Behavioral risk factors that are largely modifiable such as physical inactivity, unhealthy diet, poor sleep, increased stress, smoking and alcohol use, have been linked to an increased risk of severe COVID-19 outcomes. In light of the challenge posed by COVID-19, it seems more important than ever for governments to acknowledge the comparable importance of prevention and health promotion to health care provision. This public health crisis is multidimensional and considered a major setback for efforts to achieve the United Nation Sustainable Development Goals. Thus, it is critical at this point to create supportive socio-environmental policies

and ensure implementation of preventative measures that focus on healthy lifestyle, disease prevention, and self-care with the specific goal to overcome this pandemic in optimal overall health and hence, good quality of life. Following the above recommendations may assist people in coping with the unique situation of quarantine and/or "physical distancing" even after the situation has returned to normalcy. Preserving healthy behaviors is not only beneficial for healthy individuals, but it will also improve their quality of life if they are living with NCD.

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Conflicts of interest

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