Covid-19 Disease, Self-Isolation and Physical Inactivity

Mehmet UNAL¹ and Tulay IREZ²*

¹Faculty of Health Science, Istanbul Yeni Yuzyil University, Turkey
²Medical Faculty, Istanbul Yeni Yuzyil University, Turkey

*Corresponding author: Tulay IREZ, Medical Faculty, Istanbul Yeni Yuzyil University, Turkey

Abstract

The COVID-19 disease caused by the SARS-CoV-2 virus, which started in Wuhan, the capital of China’s Hubei province, was declared a global epidemic by the World Health Organization. Restrictive measures based on physical (social) distance are taken to prevent the spread of the disease, which manifests itself with symptoms such as high fever, dry cough, shortness of breath, weakness, and diarrhea. According to the settlement rules, nationwide quarantines covering mass quarantine have proven effective in preventing the COVID-19 outbreak in most countries. The COVID-19 pandemic also causes mental health problems in many of the environments most affected by the pandemic due to the experience of illness, physical distances, stigma and discrimination, and job losses. Healthcare workers, COVID-19 patients and patients with other illnesses, children, women, youth, and the elderly experience post-traumatic stress disorders, anxiety, depression, and insomnia. Also, prolonged homestay and physical inactivation come with risks that can endanger people’s health. As a result of physical inactivity, there are potentially undesirable risks of staying home for a long time, such as muscle atrophy, adipose tissue increase, and weight gain, exposure to insufficient sunlight, the emergence of cardiovascular diseases, suppression of the immune system, loneliness and behavioral disorders. The purpose of this article is to evaluate and discuss possible risks from physical inactivity.

Keywords

Coronavirus, SARS-CoV-2, COVID-19, Self-isolation, Physical inactivity, Sedentary behavior, Exercise, Epidemics

Introduction

Unfortunately, 2020 started with an epidemic that affected the world and killed many people. As a result of the increase in the number of patients admitted to clinics in Wuhan, China, research turned out to be a new Coronavirus epidemic. These viruses, called SARS-CoV-2, can be transmitted from animal to animal and from animal to human [1,2]. As a result of genome analysis studies, it has been reported that SARS-CoV-2 is transmitted from bats to humans [3,4]. The infection of the microorganism in humans is mostly due to the respiratory droplets produced by infected individuals while talking, exhaling, coughing, or sneezing or the interaction of these droplets with the surfaces they touch [5]. The disease has been reported to cause fever, dry cough, shortness of breath and malaise, bilateral pneumonia [6] and intestinal infections [7], and dermatological rashes [8]. (WHO) confirms that SARS-CoV-2 is transmitted to approximately 107,686,655 people worldwide, resulting in the deaths of 2,368,571 people [9]. An effective treatment protocol established and the effectiveness of the vaccines developed are in dispute [10], with limiting physical contact and social isolation seems to be the most effective strategy to control the COVID-19 [11] outbreak for now. This strategy will limit the increase in morbidity, mortality, and demand in the health system, prevent the increase of new infections caused by person-to-person transmission and prevent accumulation in hospitals. However, home quarantine, introduced to limit physical contact and social isolation, is a serious problem such as Physical Inactivity (PI) [12]. Especially in old age, PI will make many activities that people can do in their daily life activities impossible and even if the quarantine period is extended at home, the losses will not come back. At the end of the home isolation period, PI (muscle atrophy, loss of flexibility, range of motion) or weight gain cause obesity, atherosclerosis, hypertension, type 2 diabetes, vitamin D deficiency, osteoporosis, and arthrosis, etc. The COVID-19 outbreak has affected the lives of millions of people around the world.
the world and is likely to cause mental health problems among those without mental illness before and worsen the plight of pre-existing ones. Mental health problems will likely start early and continue after the epidemic is over [13]. While the experience of illness, disruption of social support, and stigma are possible causes of short-term mental health problems, factors such as economic losses are thought to potentially cause long-term mental health problems [14-16]. Covid 19 has also created chaos in countries [17-19]. In Turkey, individuals over 65 years and young people under 20 years of age for 9 months and are given permission to go out only 3 hours daily. In this regard, states need to develop an urgent strategy to prevent mental problems and the negativity of inactive life. The purpose of this article is to discuss potential risks from physical inactivity due to global quarantine. This review aims to summarize the latest research findings and to provide expert consensus.

SARS-CoV-2 and COVID-19 Disease

Coronaviruses (CoV) are a large group of Coronavirus families that cause a variety of diseases, from the common cold to more serious clinical manifestations such as Severe Acute Respiratory Syndrome (SARS-CoV) and the Middle East Respiratory Syndrome (MERS-CoV). These viruses act on the respiratory, gastrointestinal tract and central nervous systems of humans and animals [1,2]. They can infect humans and cause disease in humans. It has been reported that SARS-CoV-2 is transmitted from bats as a result of Genome analysis [3,4]. The SARS-CoV-2 infection, which started in Wuhan, the capital of China’s Hubei province, was described by WHO as a pandemic on March 11, 2020 [3,20]. Although COVID-19 disease, which is associated with SARS-CoV-2, is initially thought to be a disease that causes fever, dry cough and dyspnea, and subsequently pneumonia, it also causes gastrointestinal symptoms such as diarrhea, nausea, vomiting and dermatological rashes has been reported [6]. The incubation period of the disease has been reported as an average of 5.2 days (3-14 days) [9]. The disease is transmitted from person to person by direct inhalation of the droplets formed by coughing, sneezing or speech of sick people, or by direct or indirect contact of the sick person’s respiratory secretion materials into the mouth, nose and eye mucous membranes of healthy people. It has been reported in recent publications that there may also be oral-faecal transmission [6]. SARS-CoV-2 uses Angiotensin Converting Enzyme 2 (ACE2) as a receptor for entry into ciliary bronchial epithelial cells and type-II pneumocytes [21].

Coronaviruses recognize the receptor in the target cell with S protein and enter the cell and cause infection [22,23]. It is thought that SARS-CoV-2 also infects people by binding the S-protein to ACE2 [24].

Although the outbreak started in China, it is also quite common in Europe, America and other Asian countries [3]. Initially, after China, in most European countries, especially Italy, Spain and France after the disease is common, while Russia, Turkey and began to be widely seen in Iran. The prevalent regions of the disease are seen in the USA, Brazil, Mexico and Peru.

Data from the European Center for Disease Prevention and Control (ECdc) [21] indicate that approximately 80% of cases with Covid-19 infection heal spontaneously [25,26]. It has been reported that 14% of infected cases have a more severe form of the disease, and 6% of them are critically ill. It has been determined that the majority of severe cases and deaths occur in the elderly and those with chronic conditions [27]. In the case of Italy, 50% of those who died as a result of Covid-19 are 70-years-old or older. It has been observed that 25% of cases have two or 50% have 3 or more chronic diseases [28]. While 32% of Covid-19 patients have underlying diseases such as diabetes, hypertension and cardiovascular disease, the mortality rate in these cases has been reported to be 15% [29,30].

Staying Home and Partial Quarantine Applications

Quarantine with dictionary meaning; it is a health measure applied to prevent entry and exit to control a specific area or place and prevent the spread of an infectious disease. Similarly, quarantine for an even period of infectious disease is carried out in measures taken by not contacting people and animals in a suspicious situation, the longest incubation period of the disease. The origin of the word is Italian [31].

There is no specific antiviral drug therapy or vaccine available for Covid-19 therapy [32]. Currently, Covid-19 therapy is limited to supportive and palliative therapy. It is necessary to prevent transmission of the virus from person to person, to pay attention to social distance (should be at least 1.5 m away if possible) and not to leave the house, to prevent disease contamination and spread [33]. When the cases that result in death are examined, the average age is high and they have more than one chronic disease, while in the absence of any chronic disease, young people rarely risk death. Given that all different age groups are at risk of SARS-CoV-2 infection, it is important that all young individuals with mild or asymptomatic disease also follow self-isolation procedures to prevent the spread of the virus [34]. National quarantine practice has proven effective in most countries to slow down the COVID-19 outbreak and reduce the number of cases, according to residence rules [35,36].

These days China as well as Great Britain, Italy, Spain, France, Germany, South Africa, India, Colombia, New Zealand, by more than 50 countries in which the US and Turkey to to limit the spread of SARS-CoV-2 infection in the country restrictions are applied and people are encouraged to work from home. This strategy has been proved to be effective in curbing the COVID-19
outbreak in China and also limits the export of infected cases abroad [37,38]. When looking at the populations of countries applying partial quarantine, it can be estimated that more than half of humanity has been subjected to some kind of restrictive measures [39]. However, when home-stay, partial quarantine continues for a long time, it can present many problems related to inactivation and social isolation, disrupt social habits and endanger personal health.

**Physical Activity**

Physical Activity (PA) are physical movements that require energy to be produced as a result of contraction of skeletal muscles and spend energy above basal level. Regular, planned structured form of FA is called exercise [38]. Studies have shown that PA prolongs life and reduces the risk of mortality [39]. Exercise has positive effects on all systems in our body, from the cardiovascular system to the respiratory system, from the endocrine system to the nervous system, from the immune system to the musculoskeletal system functions [40,41]. It has been shown that cardiovascular risk factors can be reduced with PA [42]. Similarly, FAs have been reported to improve blood lipid profile, lower blood pressure, increase insulin sensitivity, improve C-reactive protein and other chronic heart disease biomarkers and strengthen the immune system [42,43]. In addition, when PA is supplemented with diet, it is an important part of weight control [44]. There are publications showing that PA plays a protective role in some types of cancer [45].

It is known that FAs have positive effects on the immune system [46]. Regular aerobic exercises have been shown to increase NK cell numbers and functions, alter CD4 T cells/CD8 T cells ratios, increase the levels of immunoglobulin M (IgM) and IgG, thereby increasing a person’s resistance to infections [47,48]. Physical activities of different intensity have different effects on the immune system [49,50]. Many studies have shown that inflammatory factors such as plasma interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF-α) and Aspartate Aminotransferase (AST) levels of medium-intensity aerobic exercises and high-intensity interval training (HIIT) has shown to have a positive effect [51,52] and improve immune function biomarkers [52].

Since FAs protect the person’s mental health as well as their immune system [53,54], they can help people cope with COVID-19-related stress and reduce their harmful effects on health [55,56]. In addition, it has been shown that sufficient FA decreases depression and fall rates, increases physical fitness of the circulatory, respiratory and musculoskeletal systems, improves well-being and cognitive functions [57]. These findings reveal the need to suggest moderate intensity exercise as a non-pharmacological, inexpensive and feasible way to deal with the SARS-CoV-2 virus. Measures in the isolation process, including the closure of gyms, the absence of going out with the fear of disease transmission, decreasing the number of arrivals to work, people preferring private vehicles away from public transportation due to viruses and increasing the opportunity to work at home, significantly disrupted the daily routines, negatively affected. It appears that all studies on COVID-19 infection focus on the treatment of the disease and termination of the pandemic. But at least as much as the Covid-19 Pandemic, perhaps more than the health and economic destruction of the Covid-19 pandemic will come up with physical inactivation.

**Physical Inactivity**

Concepts such as Physical Inactivity (PI), social distance, self-isolation and isolation at home have now become part of our daily lives [58,59]. Unfortunately, self-isolation finds global support to prevent the spread of Covid-19 disease. Due to the fear of being infected, opportunities to stay physically active have been reduced. While PI is defined as a factor that negatively affects health, WHO is defined as a pandemic, Covid-19 increased the number of physically inactive individuals due to self-isolation, on-site accommodation and working at home [60]. Today, before Covid-19, 31% of individuals over the age of 15 in the world are estimated to be physically inactive, and about 3.2 million people die annually due to PI [61]. 41% of these individuals spend time sitting more than 4 hours a day [61]. Ding, et al. in a study they did in 2013, they reported to the health care systems worldwide that the cost of PI was around $53.8 billion. In addition, PI-related deaths result in cost losses of $13.7 billion due to loss of productivity [62]. Applying mass quarantine globally according to the rules of residence will lead to more physical inactivation problems. Since PI is known to increase the risk of chronic diseases such as obesity, cardiovascular diseases (heart attack, stroke, etc.), Cancers, osteoporosis, COPD, asthma and diabetes, PI is considered a global pandemic [60]. Chronic diseases are long-term diseases that result from a combination of genetic, psychological, environmental and behavioral factors. According to the data published by WHO in 2018, it is seen that 41 million people die every year due to chronic diseases and this figure constitutes 71% of all deaths. Although chronic diseases are generally associated with the elderly population, 15 million of deaths from chronic diseases are reported to be between the ages of 30-69 and 85% of these ‘early’ deaths occur in low- and middle-income countries [63]. Considering that PI increases the rates of contracting chronic diseases, it is clear that self-isolation application will prevent the spread of Covid-19 and worsen the situation in terms of chronic diseases.

Almost all of the risk factors originating from PI are exchangeable factors, and chronic diseases that may develop with appropriate behavioral changes can be prevented. In addition to behaviors such as smoking cessation, healthy eating and reducing alcohol consumption, regular PAs have been proven to be effective in prevent-
physically active showed a 14% lower risk of mortality than individuals who were not. This figure was 35% lower in physically active individuals [65]. According to WHO’s 2009 data, PI ranks 4th among 6% of all deaths lower in physically active individuals [65]. According to this, globally sufficient gains have not been achieved in terms of providing an active lifestyle to prevent diseases [66].

One of the most negative consequences of PI is the risk of developing obesity due to excess weight gain [24]. Overweight and obesity [67] increase the risk of many pathologies such as diabetes, cardiovascular diseases, pulmonary embolism, cancers and osteoarthritis [68]. COVID-19 is a disease with a higher risk for obese people [69]. The negative clinical effects of PI in obese include muscle atrophy, weakness, fatigue, insulin resistance, dyslipidemia, decreased physical capacity and low quality of life [70]. Being in a closed environment for long periods of time causes exposure to insufficient sunlight and then deficiency of vitamin D. Vitamin D is not only necessary for bone health [71]. It also has a wide range of effects, including reducing the risk of developing pathologies such as cardiovascular and autoimmune diseases, cancer, allergies and asthma, mental disorders, metabolic syndrome and diabetes [72]. Vitamin D also improves the immune system. People with vitamin D deficiency have been shown to be at increased risk of developing respiratory infections [73]. SARS-CoV-2 is mainly a pathogen which causes respiratory infections [74], vitamin D deficiency can render severe course of the disease Covid-19 [75].

Another physical problem associated with Covid-19 disease is impaired motor function. Impaired motor function may be related to Covid-19 disease or may be associated with prolonged immobilization due to muscle atrophy. Common musculoskeletal pain, weakness, fatigue and fatigue seen in Covid-19 disease can also contribute to muscle atrophy. With decreased endurance due to muscle atrophy, cardiopulmonary exercise capacity decreases. Many patients also experience varying degrees of psychiatric disorders such as anxiety and depression both in the acute and recovery periods [76]. When the literature information is examined, it can be seen that anxiety and depression are factors that can worsen dyspnea and pulmonary functions. Pulmonary rehabilitation programs and exercises have been shown to have positive effects on dyspnea, respiratory functions, anxiety, depression, and quality of life [77].

In 11.8% of cases that died from COVID-19 reported by the Chinese National Health Commission, serious cardiac damage, high cardiac biomarkers, or cardiac arrest during hospitalization were shown, although no cardiovascular disease was previously found. Therefore, patients with COVID-19 have a high incidence of cardiovascular symptoms due to systemic inflammatory response and immune system disorders during disease progression. While COVID-19 disease causes pneumonia in the lungs, it causes acute myocardial injury or chronic damage in the future in the cardiovascular system [78]. Being physically active due to the protective gains of PA on the cardiovascular system and respiratory system and its ability to activate the immune system will contribute to the protection of our cardiovascular system before, during and after treatment of COVID-19 disease.

Spending longer time inevitably watching television, playing computer games, or surfing in social networks can remain potentially behavioral addiction disorders. The most common side effects of long-term home isolations are psychological disorders (eg sleep deprivation, self-harm), neurological complications (eg eye fatigue, headache), musculoskeletal system disorders (eg neck, back, low back pain, carpal tunnel syndrome) [79,80] and venous thrombosis associated with immobility [81].

As the epidemic spreads, many countries increase their self-isolation measures, and the number of people isolated at home increases in parallel. Today, it has been found that social isolation should be seen as a basic public health problem in the elderly, as it increases the burden of neurocognitive, mental, cardiovascular and autoimmune problems as well as depression and anxiety [82]. Moreover, recent publications have shown that inactive behavior in young people can be an important cause of depression and anxiety [83]. Therefore, self-isolation should be seen as a global health and social problem.

Applications that can be done to avoid the Damages of Physical Inactivity

As of May 27, 2020, there are 107.686.655 Covid-19 cases and 2.368.571 deaths worldwide. Covid-19 cases that will be diagnosed in the future, considering the possible 2nd and 3rd waves, may increase the number of cases [9]. And if this is not a specific treatment protocol or vaccine, it may increase the partial quarantine time to stay at home as well as the PI time. For this reason, the individuals should be told about the harms of the PI and how they can urgently start and exercise their personally prepared exercise programs. Here, media and social media should be widely used and home exercise programs should be implemented in the form of tele-exercise videos.

Social isolation applied due to Covid-19 has prevented us from doing many physical activities that are in our daily routine, to a lesser extent. Sleeping longer hours, spending more time in front of television, computer games, social media, you-tube activities have restricted our physical activities, but also changed our eating habits. A few weeks of immobilization has been shown to cause atrophy and function in the heart muscle [84],
narrowing and stiffening of the peripheral vessels [85], and disruption in macro and microcirculation [86,87]. Before the COVID-19 outbreak, the rate of PI among patients with Coronary Heart Disease (CHD) is 22.3-40.5% worldwide [12]. Social isolation due to Covid-19 and the accompanying PI will increase these rates by multiplying.

For global health promotion, WHO recommends that adults do 150 minutes of moderate-intensity aerobic physical activity per week or 75 minutes or more of intensive intensity aerobic physical activity per week [11]. In addition, WHO recommends performing muscle strengthening activities involving large muscle groups 2 or more days a week. These suggestions are to do physical activities such as walking, cycling, swimming, gardening, walking, dancing and housework for 30 minutes a day. It has been shown that moderate intensity exercises cause a 24% reduction in cardiovascular mortality rates [88] and decrease the risk of obesity, insulin resistance, type 2 diabetes and stroke [89]. Social isolation measures implemented to prevent the spread of Covid-19 are naturally difficult for individuals living in quarantine areas to implement, since the movement of individuals outside the home is almost completely prohibited. People who are forced to stay in their homes for weeks (or even months) may only occasionally move for compulsory needs or nutritional purposes. In order to minimize the harmful effects of PI that may arise in this situation, it should be suggested to encourage participation in some indoor physical activities. Although it is not possible for the majority of people with fast walking, running and cycling, indoor exercise equipment (such as treadmills, stationary bikes, etc.), movements with body weight, staircase up and down, walking, exercise bands with exercise ball or simple weights, strength and aerobic exercises can be done without the need for very special and expensive equipment [90]. Exercise training without equipment can be done through television, video or you-tube channels [91]. Here it is appropriate for everyone to make a PA, which is modified according to their age group, physical characteristics, condition and existing chronic diseases. Going up and down stairs, doing step exercises, jumping, doing sit-ups, or even doing strength training with simple tools that can be found at home can help individuals and protect against harmful effects from prolonged physical inactivity. The importance of avoiding all kinds of sports injuries while exercising should be emphasized here [92]. It is very important not only to increase the burden of hospitals unnecessarily but also to reduce the number of hospital admissions in terms of preventing the spread of SARS-CoV-2, which is widely used in hospitals, especially emergency services [93].

Conclusion

As a result, Covid-19 is an important and serious picture of viral infection caused by SARS-CoV-2. It has high transmission speed. In some patients, life threatens global health and safety in the community. Therefore, it is the most important goal to prevent the spread of the disease and reduce mortality until a specific treatment or vaccine is obtained. Social isolation is important because asymptomatic individuals have a high potential to spread the disease. Staying at home, partial quarantine practices and Covid-19 pandemics implemented to prevent the spread of the disease trigger another outbreak and ignite the wick of many diseases that may arise due to PI. We need to organize these two outbreaks very well. When trying to eliminate one, one should not trigger the other, which will lead to much more dangerous consequences. Strategies such as “move more and sit less” to patients at risk should be recommended, at least to reduce the harmful effects of the inactivity they are exposed to during self-isolation and to prevent long-term immobility [94].

The PI pandemic will continue for a long time, even after getting rid of the COVID-19 pandemic. The negative effects of the endless Covid-19 pandemic on health and the economy will continue with intensification. In fact, the recommendations made to minimize the harmful effects of the Covid 19 pandemic are quite innocent. A medium intensity PA [95] of 150 minutes or more per week is sufficient to eliminate problems caused by PI. As few as 4000 steps a day at any speed has been shown to improve long-term health [96,97]. Each additional hour of sitting is estimated to result in an increase of $126 in annual health costs for older adults [98]. In fact, the 2018 US Physical Activity Guidelines have confirmed the harmful effect of long-term sitting time, and any decrease in PI and increase in FA, even if this increase is below the recommended target, has been reported to have a significant benefit to health [94]. The COVID-19 pandemic will accelerate the PI pandemic, which we have been facing for a long time, and which we have not bent on very much. Due to the COVID-19 pandemic, many opportunities to be physically active, including fitness centers, public parks and hiking trails, have been suspended. As a result, during the Covid-19 pandemic, people who already tend to be inactive have become more inactive than before. Home isolation applied to prevent the spread of SARS-CoV-2 can lead patients to adopt a sedentary lifestyle and also lead to obesity, joint disorders, vitamin D deficiency, osteopenia, osteoporosis, muscle atrophy, decreased functional capacity, behavioral changes and depression. Having to adopt the lifestyle of the community at home will speed up the PI pandemic and increase its harmful effects. The lesson from the Covid-19 pandemic seems to require a global organization similar to the COVID-19 pandemic in order to eliminate the economic burden of Covid-19 disease and PI pandemics that are at least as harmful as Covid-19 disease.
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