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## REVIEW ARTICLE

### Sanitary and Hygienic Aspects of the COVID-19 Self-isolation

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#### Abstract:

##### Introduction:

Self-isolation during the COVID-19 pandemic is a temporary measure to limit the spread of infection. All citizens arriving from abroad to Russia must comply with the rules of self-isolation. Since April 2, 2020, almost all citizens of the Russian Federation have followed the rules of self-isolation. Also, this month in the Russian capital, Moscow, about 6 million citizens have isolated themselves. In general, in the territory of Russia, the number of citizens on self-isolation reached 100 million. Billions of citizens around the world are staying at home due to the self-isolation regime, so a sanitary assessment must be considered. Self-isolation, characterized by physical inactivity, hypoxia, diet disturbances, lifestyle changes during work / rest, mental stress; this provides an opportunity to identify the presence of public health risk factors and contributes to an increase in the incidence of Non Communicable Diseases (NCDs).

##### Purpose of the Study:

Carrying out a sanitary-hygienic assessment of COVID-19 self-isolation, determining priority risk factors causing non-infectious diseases, and proposing preventive measures.

##### Objectives:

To Identify public health risk factors during self-isolation. To conduct a comprehensive hygienic assessment of self-isolation according to the priority criteria. To develop a pointing system (hygiene index for self-isolation). To propose measures to minimize health risks during self-isolation.

##### Materials and Methods:

We used analytical, and systematization approaches. Information from the legal documents of the hygienic-sanitary laws of the Government of the Russian Federation (nutrition hygiene, hygiene of workforce, children, and teenagers). World Health Organization COVID-19 documents.

##### Research Results:

We assessed the sanitary-hygienic aspects of self-isolation to identify the leading risk factors on public health, and as a result, we proposed hygienic criteria for self-isolation. We developed a hygienic self-isolation index point score (HSIPS) that considers the Russian law-based requirements for diet, work, rest, and physical activities. Thus, the usage of those hygienic standards is beneficial to prevent public health risks in ordinary and extremely challenging conditions of self-isolation. We proposed measures to minimize risks during self-isolation, and we based them on adequate sanitary-hygienic standards. The main sanitary-hygienic risk factors of self-isolation are: sedentary lifestyle, hypoxia, nutritional deficiencies (malnutrition), and work/rest imbalance.

##### Conclusion:

We proposed a sanitary-hygienic definition of self-isolation. We identified leading risk factors for public health of the self-isolated population. We proposed sanitary-hygienic criteria for assessing self-isolation based on the regulations and standards of the Government of the Russian Federation. We developed a hygienic self-isolation index point score (HSIPS), which determines that the optimal mode is directly proportional to the coefficients of a person's physical activity (D), indoor area (air cubic capacity) per isolated (S), time spent in fresh air (T) and inversely proportional to the calorie intake. We proposed measures to prevent noncommunicable diseases (NCD) for citizens on self-isolation.

**Keywords:** COVID-19, Self-isolation, Health risks, Sanitary-hygienic regulations, Public health, noncommunicable diseases.

#### Article History

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## 1. INTRODUCTION

Self-isolation is an effective forced measure that has many aspects: administrative, sanitary, epidemiological, and preventive. It aims to create a mechanism of transmission of infectious agents and to minimize contacts in the population in order to prevent the spread of the new COVID-19 infection.

From a hygienic point of view, self-isolation means forced long-term (more than a month) staying of a person in a limited space and entirely avoiding contact with others, and a decrease in physical activities.

There are three main types of self-isolation:

1. Scientific experimental;
2. In-home isolation for healthy people and patients with disease in mild forms;
3. Self-isolation for medical workers.

Scientific experimental self-isolation in space flights began in the late 60s at the Institute of Biomedical Problems of the Russian Academy of Sciences [1].

In-depth studies assessed nutritional status, nutrition preferences, or changes that occur if using the same diet for a long time in isolation conditions.

Studies showed that self-isolation leads to the occurrence of critical psychological problems [2].

Launching programs like IRIUS-19 International Isolation Experiment in 2020 might show significant results in the future; a program for a period of up to five years that aims to study the crew activities in an artificial environment that optimizes health standards, align the necessary food resources and the necessary preventive measures [3]. Such scientific experiments are volunteer-based, and the participants are under constant medical supervision [4].

Self-isolation as in 2020 has no similarities in the history of humankind, especially when it comes to the population size. Since April 2020, only in Moscow, Russia, about 6 million citizens were self-isolated [5]. Generally, in the territory of the Russian Federation, the number of citizens on self-isolation reached up to 100 million people. According to the AFP database, more than 3,38 billion citizens all over the world stay self-isolated to prevent COVID-19. That means about 43% of the total population of the world (7,79 billion people, according to United Nations statistics in 2020) [6].

The Self-isolation regime affects a significant number of people of different sex and age, including those with various chronic diseases. Many factors can affect self-isolation negatively: high nervous tension and the duration of staying home for several months.

Several risk factors proved the importance of sanitary-hygienic assessment and the need for developing measures to prevent harmful effects on public health; these risk factors include:

1. Sedentary lifestyle.
2. Hypoxia: a lower-than-normal concentration of oxygen in arterial blood.
3. Nutritional deficiencies (Malnutrition).
4. Work/rest imbalance.

In Russia, we created a methodology that includes necessary standards: hygienic, nutrition-physiological, physical activity, work/rest balance.

It is essential to follow specific sanitary-hygienic standards for an adequate assessment of energy and nutrient intakes by gender and age groups.

It is possible to apply hygienic standards in different modes: physiologically optimal, micro-climate indicators, physical activity, work/rest modes.

We believe that it is necessary to apply hygiene standards for the hygienic assessment of self-isolation.

In Russia, we applied regulations for the physiological needs of energy and nutrients, and we use them for various groups of the population; thus, we can assess and control the consumption of irreplaceable food substances and energy sources.

The Total Energy Expenditure (TEE) consists of three main components:

1. Basal metabolic rate;
2. Energy expended during physical activity;
3. Energy required for metabolism of the infused substrates.

According to the total energy expenditure (TEE), we divided the adult population into eight groups (5 for males and 3 for females), taking into account physical activity and other energy expenditures.

For self-isolation, it seems appropriate to consider a group that is characterized by deficient physical activity for both males and females; these are scientists, university professors, students, and medical specialists. The energy expended during the physical activity of this group of citizens is 1.4 [7].

In Russia, there is a color indication on the labeling of food products. These labels take into account the content of added sugar, salt, saturated fatty acids, trans-fatty acids, and the analysis of the average daily food consumption to increase public awareness; this as an additional measure to prevent the growth of several diseases such as: overweight, obesity, type 2 diabetes (T2D), and cardiovascular diseases [8].

Paying particular attention to organizing the online learning process at home, it is essential to consider breaks between mastering the literature and completing the homework assignments. Also, it is essential not to forget about diet control.

It is vital to pay special attention to organizing the online learning process at home; therefore, it is essential to consider breaks between mastering the literature and completing the homework assignments. Also, it is necessary not to forget

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about diet control; For students, there are recommendations for taking into account the seasonality, the need for essential nutrients and calculating the daily calorie needs according to two age groups (8-11 and 12-18 years).

We propose a sample diet plan that should be reviewed and changed regularly and should take into account the energy content of meals (20% for breakfast; 30-35% for lunch; 15% for afternoon tea; 25% for dinner; and 5-10% for the second dinner).

Thus, the daily diet (2-6 meals) must contain meat, milk, butter, vegetable oil, rye bread, and wheat. Once every 2-3 days, we recommend adding fish, eggs, cheese, cottage cheese, dairy products [9].

For evaluating self-isolation, we proposed the following sanitary-hygienic criteria:

1. Self-isolation location (apartment, cottage, country house, or hotel); that determines the ability to get fresh air, and limit hypoxia.
2. Size of self-isolation area per person; that determines the physical activity.
3. Physical activities including sports simulators, gymnastics, time spent on getting fresh air (walking with animals, visiting shops, pharmacies, frequency of airing the rooms, outdoor activities).
4. Work schedules, including online work activities.
5. Rest Schedules.
6. Psycho-emotional stress, and the negative effect of enclosed spaces.

Based on these sanitary-hygienic criteria, we developed a hygienic self-isolation index point score (HSIPS) to evaluate self-isolation. This index gives the ability to access self-isolation from a hygienic point of view; it allows us to determine compliance with self-isolation, and the established hygienic and physiological standards.

$$HSIPS = \frac{D + S + T}{K}$$

(Equation 1. HSIPS)

*D* stands for the motor activity of a person; *S* stands for the space of isolation area (cubic meter air) per isolated person; *T* stands for outdoor activities time (hours); *K* stands for calorie or energy intake.

- Motor activity of a person (*D*)

The actual physical activity (the number of calories spent on each physical exercise)/ exercise time. Recommendations of the World Health Organization [10].

- Space of isolation (cubic meter air) per isolated person (*S*)

The actual area (cubic capacity) of self-isolation area:

In a 20 m<sup>2</sup> total area per person: K= 3 m<sup>3</sup>/hour [11].

If the total area is not less than 20 m<sup>2</sup> per person: K=not

less than 30 m<sup>3</sup>/hour.

- Outdoor activities time (*T*)

Time for getting fresh air (hours).

- Calorie or energy intake (*K*)

The caloric value of food (indicated on the label); physiological energy requirements for adults from 2100 to 4200 kcal [12] /day for males and from 1800 to 3050 kcal/day for females [13].

Based on the hygienic index, it is evident that a person who shows physical activity in fresh air or a well-ventilated room and eats healthy (according to his energy expenditure) is reducing several risks such as physical inactivity, hypoxia, and obesity.

We believe that it is possible to use this pointing system (index) to assess self-isolation; an optimal self-isolation index equals 3 points, a favorable equals more than 3 points, and an unfavorable less than 3 points.

The sanitary-hygienic assessment of self-isolation will allow us to prevent many diseases like cardiovascular and musculoskeletal diseases and reduce the risk of different non-infectious diseases and the level of neuro-depressive conditions in the population.

## 2. DISCUSSION

Pandemics are representing a real risk, and the practical and scientific experience showed that the best ways to manage them are self-isolation and social distance; this gives the ability to reduce the risk of infection and the spread of the infectious agent in the population [14].

Epidemics affect not only physical health but also the mental health and wellbeing of the uninfected population.

Severe studies showed that the emerging infectious diseases and their consequences, such as Severe Acute Respiratory Syndrome (SARS), could increase the level of anxiety, depression, and stress among the population [15]. These negative emotions can affect sleep patterns [16].

The Chinese government during the COVID-19 epidemic isolated people from different categories: citizens with diseases in mild forms, suspected infected citizens, and those citizens who were in close contact with patients.

Nevertheless, they isolated citizens who did not get infected and remained physically healthy, those who mainly suffered from negative psychological consequences [17].

Thus, maintaining mental and physical health in the population is a crucial factor in decreasing the risks during the spread of COVID-19.

## 3. RECOMMENDATIONS

### 3.1. Nutrition

1. During self-isolation, it is essential to control nutrition.
2. Make a diet plan that allows having meals on time and avoid overeating.

3. Include grain products in the plan (contain more complex carbohydrates and cellulose, which have a beneficial effect on saturation and prevent overeating).

4. Begin the plan by consuming short shelf-life products and end it with frozen food.

5. Follow food safety information, track product expiration dates, continuously clean kitchen surfaces, and wash hands before and after cooking.

6. Give priority to fruit and vegetables, and do not add sugar to food and drinks.

7. Reduce salt

8. Drink 2 liters of water every day during self-isolation [18].

9. Include three main meals and 1-2 additional meals to the plan.

10. The diet plan must contain dietary supplements (vitamin and mineral complexes).

11. Exclude sugar, flour products, sugary sodas, fatty meats, cheese, chips, and fast food from the diet plan [19].

### 3.2. Physical Activity

During self-isolation, regular and adequate levels of physical activity play an essential role in maintaining health, wellbeing, and quality of life.

1. Create a workout plan (warm-up stretches and exercises).

2. Use online workout classes, and take into account the limitations.

3. Try to move around the apartment (walking during phone calls, march on the spot).

4. Every half-hour, position changing is required (sitting or lying).

5. Consider different physical activities to relax muscles [20].

### 3.3. Work and Rest

It is essential to create a comfortable environment for distance working and learning for adults and school children during the period of self-isolation.

1. The workplace should be near to the window to get the sunlight on the working table.

2. It is also necessary to install artificial lighting at the workplace (the lights should take the upper position).

3. The workplace should consider enough space for work and a personal computer (PC).

4. Choose working furniture with the priority of the best setting position.

5. Working areas should always be ventilated, subjected to daily wet cleaning, and away from the sources of extraneous noise [21].

### 3.4. Mental Health

During self-isolation, every person could experience fear, anxiety, and confusion.

The following rules aim to manage this emotional discomfort:

1. Support communication via the Internet with relatives and friends.

2. Reading and watching the news, without spending all the free time on them;

3. Refusing to consume tobacco and alcoholic beverages;

4. Finding official well-trusted information resources to evaluate and understand the situation, the risks, and the precautions;

5. Setting aside 8 hours a day to maintain proper nutrition and to remain physically active [22, 23].

### CONCLUSION

1. We proposed a sanitary-hygienic definition of self-isolation.

2. We identified the leading health risk factors of the self-isolated population in the Russian Federation.

3. Based on the regulations of the Russian Federation, we proposed sanitary-hygienic criteria for assessing self-isolation.

4. We developed a hygienic self-isolation index point score (HSIPS) that allows us to assess self-isolation and gives us the ability to determine the optimal, favorable, and unfavorable self-isolation conditions.

5. The sanitary-hygienic assessment of self-isolation aims to prevent cardiovascular, diet-dependent, and musculoskeletal diseases.

6. We proposed measures to prevent noncommunicable diseases (NCD) among the self-isolated population.

### CONSENT FOR PUBLICATION

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### CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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### REFERENCES

- [1] Harb. The SIRIUS-19 project is a four-month simulation of an expedition to the moon in a ground-based complex in Moscow. 2019. <https://habr.com/ru/post/444486/>
- [2] Tutelyan VA, Baturin AK, MD, Gapparov MG. Balanced diet In: Rospotrebnadzor methodical recommendations. Moscow, Russia 2008.
- [3] Chief state sanitary physician of the Russian Federation. Sanitary and epidemiological requirements for living conditions in residential buildings and premises In: Sanitary and epidemiological rules and

- regulations SanPiN . Moscow, Russia 2010.
- [4] Chief state sanitary physician of the Russian Federation. Sanitary and epidemiological requirements for physical factors in the workplace In: Sanitary and epidemiological rules and regulations SanPiN. Moscow, Russia 2016.
- [5] Botella Cristina, Baños Rosa María, Etchemendy Ernestina, Garcia-Palacios Azucena, Raya Mariano Alcañiz. Psychological countermeasures in manned space missions: "EARTH" system for the Mars-500 project *Computers in Human Behavior* 2016; 55: 898-908.
- [6] Roscosmos. SIRIUS-19 Experiment. 2009. <https://www.roskosmos.ru/25965/>
- [7] Chief state sanitary physician of the Russian Federation In: Sanitary and epidemiological rules and regulations SanPiN. Moscow, Russia 2008.
- [8] Reznik OI, Bagirov VA, Tutelian VA, *et al.* Color indication on food labeling to inform consumers. In: *Rospotrebnadzor methodical recommendations*. Moscow, Russia 2018.
- [9] Chief state sanitary physician of the Russian Federation In: Sanitary and epidemiological rules and regulations SanPiN. Moscow, Russia 2010.
- [10] World Health Organization. Physical Activity Global Guidelines for Health. [https://www.who.int/dietphysicalactivity/factsheet\\_recommendations/ru/2020](https://www.who.int/dietphysicalactivity/factsheet_recommendations/ru/2020).
- [11] Ministry of Construction, Housing, and Utilities of the Russian Federation. Multicompartment residential buildings In: Set of rules. Moscow, Russia 2017.
- [12] Chief state sanitary physician of the Russian Federation. Hygienic Safety Requirements In: Sanitary and epidemiological rules and regulations SanPiN. Moscow, Russia 2001.
- [13] Akopova NE, Emelyanova EV, Kuchurova LS, Terentyev AV, Lomanova EV. *Rospotrebnadzor methodical recommendations 2312432-08*. Moscow, Russia 2009.
- [14] Haug A, Brand-Miller JC, Christophersen OA, McArthur J, Fayet F, Truswell S. A food "lifeboat": food and nutrition considerations in the event of a pandemic or other catastrophe. *Med J Aust* 2007; 187(11-12): 674-6. [<http://dx.doi.org/10.5694/j.1326-5377.2007.tb01471.x>] [PMID: 18072916]
- [15] Wu KK, Chan SK, Ma TM. Posttraumatic stress, anxiety, and depression in survivors of severe acute respiratory syndrome (SARS). *J Trauma Stress* 2005; 18(1): 39-42. [<http://dx.doi.org/10.1002/jts.20004>] [PMID: 16281194]
- [16] Haug A, Brand-Miller JC, Christophersen OA, McArthur J, Fayet F, Truswell S. A food "lifeboat": food and nutrition considerations in the event of a pandemic or other catastrophe. *Med J Aust* 2007; 187(11-12): 674-6. [<http://dx.doi.org/10.5694/j.1326-5377.2007.tb01471.x>] [PMID: 18072916]
- [17] Shen L, van Schie J, Ditchburn G, Brook L, Bei B. Positive and Negative Emotions: Differential Associations with Sleep Duration and Quality in Adolescents. *J Youth Adolesc* 2018; 47(12): 2584-95. [<http://dx.doi.org/10.1007/s10964-018-0899-1>] [PMID: 30039509]
- [18] Irwin M. Effects of sleep and sleep loss on immunity and cytokines. *Brain Behav Immun* 2002; 16(5): 503-12. [[http://dx.doi.org/10.1016/S0889-1591\(02\)00003-X](http://dx.doi.org/10.1016/S0889-1591(02)00003-X)] [PMID: 12401464]
- [19] Health Nutrition Education Center. <https://pitanie.cgon.ru/>
- [20] World Health Organization. Food and nutrition tips during self-quarantine <http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/novel-coronavirus-2019-ncov-technical-guidance-OLD/food-and-nutrition-tips-during-self-quarantine>
- [21] Rospotrebnadzor. Self-isolation diet plan. 2020. <http://77.rospotrebnadzor.ru/index.php/napravlenie/profinfab/8142-fits-pitaniya-i-biotekhnologii-razrabotal-printsipy-ratsiona-dlya-lits-nakhodyashchikhsya-v-rezhime-samoizolyatsii>
- [22] Rospotrebnadzor. How to maintain physical activity.. <http://cgon.rospotrebnadzor.ru/upload/medialibrary/34a/34a623bbfeb0a9bd5b0d4fd23aa5a3d.png>
- [23] World Health Organization. Stay physically active during self-quarantine <http://cgon.rospotrebnadzor.ru/upload/medialibrary/8ee/8eec6ead367b43c78a1d3332691200ce.png>

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