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COVID-19 Pandemic: Sanitary-Hygienic Aspects of Self-Isolation †

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Abstract: Self-isolation is a preventive measure that started in January 2020 as a response to the spread of the coronavirus COVID-19 infection, and it has no precedents in human history. During this pandemic, governments forced billions of people to self-isolate for several months, and the sanitary-hygienic assessment of self-isolation became an essential issue. A sanitary-hygienic definition of self-isolation was proposed and also, methods for assessing it were developed. Hygienic Self-Isolation Index Point Score (HSIPS) determines that the optimal isolation is directly proportional to the coefficients of a person's physical activity, indoor area per isolated person, and time spent in the fresh air. HSIPS can identify if isolation is optimal, favorable, or unfavorable. Furthermore, methods to assess the level of the functional reserves of the body were determined, and also the leading health risk factors of the self-isolated population were identified. The sanitary-hygienic assessment of self-isolation can ensure the prevention of cardiovascular, alimentary-dependent diseases, and pathologies of the musculoskeletal system. Besides, self-isolation accompanies a decrease in physical activity and unbalanced nutrition.

Keywords: COVID-19; Self-Isolation; Health Risks; Sanitary-Hygienic Regulation; Mental Health

1. Introduction

Isolation refers to the separation and restricted movement of ill persons who have a contagious disease, and quarantine refers to the restriction of movement or separation of well-persons who have been exposed to a contagious disease. But according to our knowledge, it is possible to use the terms isolation or self-isolation to describe any stay-at-home orders (both isolation and quarantine). Merriam-Webster Dictionary defines self-isolation as the act of isolating or separating oneself or itself from others [1-2].

COVID-19 is a new disaster that has come to the fore, and today, self-isolation is an essential tool owned by public health authorities to prevent the spread of infectious diseases. Carrying out any public health measure requires an immediate risk assessment, and self-isolation is never an exception. Consequently, for self-isolation, the risk factors may include nutritional deficiencies, hypodynamia, hypoxia, mental health, and an imbalance between work and rest. The Russian government has sanitary-hygienic regulations that determine all the recommended physiological and hygienic standards for (1) Physical Activity, (2) Nutrition, (3) Mental Health, (4) Work, and (5) Rest [3].

The hygienic standards can be employed for supporting physiologically optimal conditions for staying at home, work-rest regimes, microclimate indicators, nutrition, mental wellness, and physical activity. [4-6]

This study aims to establish sanitary-hygienic assessment criteria for self-isolation; to propose measures that prevent potential non-communicable diseases in the isolated population; to identify the leading risk factors affecting the health of the isolated persons;

to propose sanitary-hygienic criteria for assessing self-isolation based on the standards of the Russian Federation.

2. Materials and Methods

Informational, analytical, and statistical research methods were applied: We analyzed hygiene-related legal documents of the Government of the Russian Federation, and COVID-19-related publications of the World Health Organization (WHO) and public health authorities of various governments.

3. Results and Discussion

The Russian Federation regulations and standards consider the estimated energy requirements (EER) that determine the physiological needs for energy and nutrients of various groups of the population. Estimated Energy Requirement (EER) is the average dietary energy intake that is predicted to maintain energy balance in healthy, normal-weight individuals of a defined age, gender, weight, height, and level of physical activity consistent with good health. In children and pregnant and lactating women, the EER includes the needs associated with growth or secretion of milk at rates consistent with good health. The physical activity coefficients are used in the EER equations to estimate energy requirements and are based on ranges of physical activity levels. The Physical Activity Level (PAL) is the ratio of total energy expenditure to basal energy expenditure (TEE/BEE) [7].

Optimal nutrition determines the protection of an isolated person from the effects of adverse factors, and for maintaining a healthy weight, it is necessary to maintain a full, adequate diet with a decrease in calorie content by 200-400 kcal compared to the usual one, which on average is:

- 1500 kcal for children aged 3 to 7 years (considering the level of physical activity);
- 1600-2000 kcal for children aged 7 to 18 (considering the level of physical activity);
- 1600-1800 kcal for healthy women over 18 years old;
- 1800-2100 kcal for healthy men over 18 years old.

Recommended percentage distribution of energy consumption of meals: breakfast - 25%, second breakfast - 5%, lunch - 35%, afternoon tea - 10%, dinner - 25% [8].

A healthy diet is essential for self-isolated distance learning students, and they should into consideration the following recommendations:

(1) Considering 2-6 meals a day that should include meat, milk, butter, vegetable oil, rye, and wheat bread; (2) Including fish, eggs, cheese, cottage cheese, dairy products at least one time every 2-3 days; (3) Considering a sample menu that contains a rational distribution of energy in every meal: breakfast - 20%, lunch - 30-35%, afternoon tea - 15%, dinner - 25%, and second dinner - 5-10% [9].

While organizing education for children during the enforcement of self-isolation, it is necessary to consider: (1) Regular breaks between lessons; (2) Ventilating the study spot, and getting fresh air regularly in balcony or loggia; (3) Carrying out physical exercises, performing gymnastics, and using simulators to organize independent fitness classes at home [10].

The sanitary-hygienic criteria of self-isolation:

1. Time spent in fresh air including dog walking, visiting grocery stores, pharmacies, or spending time in balconies;
2. The size of the isolation area per person;
3. Interactive condition of work regimen using computer technology;
4. Psycho-emotional stress, long-term stay in a limited space, and stress;
5. The location of the self-isolated person (apartment, country house, or hotel) can determine the possibility of getting fresh air and limiting hypoxia;
6. The physical activity of each isolated person, such as the use of sports equipment and gymnastics;
7. Rest regimen.

Based on the sanitary-hygienic criteria of self-isolation, we developed a hygienic self-isolation index point score (HSIPS) to assess the risks of self-isolation. This index is convenient and beneficial for establishing a comprehensive hygienic assessment for self-isolation and determining the isolation compliance level using all the recommended physiological-hygienic standards.

HSIPS 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 person (S), time spent in fresh air (T); and inversely proportional to the calorie intake.

$$HSIPS = \frac{D+S+T}{K}, \quad (1)$$

- **Physical activity of an isolated person (D):** The actual physical activity (the number of calories spent on each physical exercise) exercise time. (Recommendations of the World Health Organization) [11].
- **Space of isolation (cubic meter of air) per isolated person (S):** The actual space (cubic capacity) of self-isolation area: In a 20 m^2 total area per person: K= 3 m^3/hour. If the total area is not less than 20 m^2 per person: K= not less than 30 m^3/hour [12].
- **Time spent on outdoor activities (T):** Time spent on getting fresh air (hours).
- **Calorie or energy intake (K)** The caloric value of food (indicated on the product labels); physiological energy requirements for adults from 2100 to 4200 kcal/day for males and from 1800 to 3050 kcal/day for females [13-14].

HSIPS confirms that the more an isolated person spends time on physical fresh-air activities, or in a ventilated room, and eats according to his energy expenditure, the fewer he\she may expose the risks of hypodynamia, hypoxia, and obesity.

It appears possible to assess self-isolation in points: the optimal hygienic index of self-isolation is equal to 3, the favorable index is greater than 3, and the unfavorable index is less than 3 (Table 1).

Table 1. Assessing self-isolation in points.

Favorable Isolation	Optimal Isolation	Unfavorable Isolation
HSIPS > 3	HSIPS = 3	HSIPS < 3

The sanitary-hygienic assessment of self-isolation will ensure preventing diseases of the cardiovascular system and the musculoskeletal system. Furthermore, it will reduce the risk of other non-infectious diseases, and the level of neuro depressive conditions in the population.

The spread of coronavirus COVID-19 and the enforcement of public health measures ended in unintended unfavorable effects such as high levels of stress, anxiety, and depression [15].

The massive fear of coronavirus (coronaphobia) has developed many psychiatric manifestations in different strata of society. Besides, pandemics are a real risk and are best managed by self-isolation and social distancing to reduce the risk of infectious diseases [16-17].

During pandemics like COVID-19 and the enforcement of self-isolation measures, infectious diseases are not only a physical health concern, but also affect mental health and wellbeing [18].

The prevalence of new infectious diseases and their consequences can increase anxiety, depression, and stress. A straightforward example of this phenomenon is that during the COVID-19 epidemiology in Central China, even the healthy self-isolated population experienced mental health issues [19-20].

It seems that those with preexisting mental health issues are more susceptible to stressors associated with COVID-19 compared to those without preexisting mental health issues [21].

Thus, it is clear that maintaining mental and physical health are essential factors in minimizing the risks affecting the isolated population [22].

4. Conclusion

1. The sanitary-hygienic assessment of self-isolation will ensure the prevention of cardiovascular, alimentary-dependent diseases, and pathologies of the musculoskeletal system.
2. We proposed measures that aim to prevent non-communicable diseases in the isolated population.
3. We identified the leading risk factors affecting the health of the isolated population.
4. We proposed sanitary-hygienic criteria for assessing self-isolation based on the sanitary-hygienic standards of the Russian Federation.
5. We developed a hygienic self-isolation index point score (HSIPS) that 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 person (S), time spent in fresh air (T); and inversely proportional to the calorie intake.
6. The self-isolation index point score (HSIPS) determines if self-isolation is optimal, favorable, or unfavorable.

5. Recommendations

5.1. Nutrition

1. During the period of self-isolation, one should pay special attention to the diet.
2. Giving preference to products with short shelf life, and then use frozen food for cooking;
3. Making a meal plan that helps to avoid overeating;
4. Choosing a variety of foods when forming a menu for the day, giving preference to grains, because they are rich in complex carbohydrates and fiber, which have a beneficial effect on the feeling of fullness and prevent overeating;
5. Including three main meals and 1-2 additional meals to the diet, and excluding sugar and flour products, sweet carbonated drinks, fatty meats, cheese, fast food, and chips.
6. Following food safety rules, tracking the expiration dates of products, keeping the kitchen work surfaces clean, washing hands before and after cooking;
7. Giving preference for fruits and vegetables as sources of fructose and sucrose, and keeping in mind that adding sugar to food and drinks is not recommended;
8. Reducing salt intake in the diet;
9. Drinking at least 2 liters of water per day during self-isolation [23-27].

5.2. Physical Activity

During self-isolation, it is important to maintain adequate physical activity, which has a beneficial effect on physical and mental health.

1. Spending more time standing, and less time sitting or lying;
2. Including active breaks in the daily routine in the form of warm-up or household chores;
3. Trying to move around the apartment (more walking during a phone call, marching in place);
4. Considering alternate physical activities with muscle relaxation;
5. Using online resources proposing physical exercises, considering the state of your health and limitations [28].

5.3. Work-Life Balance

Due to the implementation of distance education and work during self-isolation, it is essential to design a comfortable working environment.

1. The workplace should be organized with enough space for a personal computer and enough space for writing;
2. The design of the furniture for distance work and education should support a proper working posture;

3. The workplace should be lighted artificially using a lighting device in the upper position.
4. The workplace place should be ventilated, cleaned every day, and far from any possible sources of extraneous noise.
5. The workplace should be next to the window for increasing the natural illumination on the work surface [29-30].

5.4. Mental Health

The isolated population may experience mental health issues such as fear, anxiety, and confusion.

1. Referring to the official information sources to assess the situation and to understand the risks and precautions;
2. Getting at least 8 hours of sleep a day, eating well, and staying physically active;
3. Having an interest in the news, but not spending all the free time on them;
4. Maintaining communication via the Internet with relatives and friends;
5. Quitting tobacco smoking and alcoholic beverage consumption [31].

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