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CHAPTER 12

Methods of prophylaxis and control for young people during COVID-19 period

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12.1 COVID-19 around the world

The agent that caused the third global pandemic is SARS-CoV-2, a newly identified B-coronavirus. The focus was on the Wuhan region of China. Clinical symptoms included fever, dry cough, shortness of breath (dyspnea), pulmonary changes (imaging) (Lauxmann, Santucci, & Autrán-Gómez, 2020), and myalgias (Baj, Karakuła-Juchnowicz, Teresiński, Buszewicz, & Ciesielka, 2020; Wang, Zhu, & Xu, 2020).

At the end of 2019, the outbreak of the disease caused by coronavirus was in Wuhan, with a particularly important impact on the public health. The perception of the role of COVID-19 among students in China during the quarantine period was assessed (Ding, Du, Li, & Zhang, 2020) and it was revealed that female students, and generally students except the ones in medicine, had a higher risk perception.

The World Health Organization named this disease Coronavirus 2019 (COVID-19). In May 2020 the number of confirmed cases worldwide was over 4 million, with approximately 279,000 deaths (Lauxmann, Santucci, & Autrán-Gómez, 2020).

In June 2020, the number of confirmed cases was 7.8 million and there were 430,000 deaths registered (Ngwewondo, Nkengazong, Ambe, & Ebogo, 2020).

The pandemic triggered by COVID-19 brought to the world not only an increased risk of death but also an important psychological pressure.

A study conducted in 2019 (Cao, Fang, Hou, & Han, 2020) showed that over 20% of the respondents to the study had mild anxiety, influenced by the economic effects and by the ones caused by daily activities.

12.1.1 Consequences of the quarantine period/lockdown

In France (Wathelet, Duhem, Vaiva, Baubet, & Habran, 2020) the quarantine measures of the population showed its influence on students who were significantly influenced by isolation, but also by social and sociodemographic changes, by health conditions, and by the role of the media while reporting information. The level of

stress was increased in this age group, whereas the physical isolation influenced the social relations, by taking into account the public information.

The quarantine installed in China led to the appearance in students (but not only) of posttraumatic stress disorder and of depression (Tang et al., 2020).

Also, in Iran a study (Hossein Taghrir, Borazjani, & Shiraly, 2020) was conducted on the medical students with regard to the preventive behavior and risk perception for COVID-19. Over 90% of them had preventive behavior and a moderate risk perception in this population group.

In the UK the impact of reopening schools and the relaxing measures of physical distance was assessed. The study (Panovska-Griffiths et al., 2020) showed that these measures, without symptomatic testing and follow-up of contacts, are likely to induce a second peak wave in December 2020.

The isolation of symptomatic cases and the follow-up of contacts were early measures to isolate the virus for many countries.

Kucharski's study (Kucharski, Klepac, & Conlan, 2020) showed that a period of self-isolation is needed in each country according to the number of illnesses, combined with physical distance measures and follow-up of contacts.

Also, Zhou et al.'s studies (Zhou, Wang, Yang, & Yang, 2020; Zhou, Zhang, Wang, & Guo, 2020) assessed the prevalence and sociodemographic correlations of the symptoms of sleep disorders in young adolescents affected by COVID-19. The questionnaires assessed the health conditions, the state of general anxiety and that related to the pandemic, to depression, and to the quality of sleep. The results showed an increased prevalence of sleep disorders in this population group, especially during the quarantine period.

Wang et al. (Wang, Yang, Yang, Liu, & Li, 2020) showed that there is no direct association between the COVID-19 epidemic and the risk of anxiety/depression in students. However, factors associated with the COVID-19 epidemic may be associated with an increased risk of depressive symptoms.

From March to May 2020, quarantine and emergency measures were applied in Italy in order to limit the spread of the virus (Gallè, Sabella, Ferracuti, De Giglio, & Caggiano, 2020).

Thus they restricted movement and physical contact between people, and they increased inactivity.

The study assessed the students' physical activity during this period by using questionnaires.

There was a reduction in the physical activity and in the gait but an increase in the activities related to the use of various electronic devices at home.

An active lifestyle presented even online could have had a positive effect during the quarantine period on health management, and it could have improved functional capacity for people in isolation.

In Spain, too, Babarro's study (Castañeda-Babarro, Arbillaga-Etxarri, Gutiérrez-Santamaría, & Coca, 2020) showed in young adults a reduction in their walking time and physical activities, especially in males, which is obvious in people who used to be very active before the pandemic.

The COVID-19 pandemic has negatively affected the lifestyle of the world's population, regardless of age.

12.1.2 Impact of the social and physical isolation

Zhang et al.'s study (Zhang et al., 2020) aimed at assessing the impact of social and physical isolation on the level of physical activity and mood of young people, by filling in online questionnaires.

Physical activity was assessed by using the questionnaire called IPAQ-SP Short Formary and the Profile of Mood States. The results showed an average of 23 minutes per day of physical activity, more in boys. Emotional mood in boys was lower than in girls. So the girls tolerated and better managed the isolation conditions and the physical inactivity. Even though the physical activity was reduced, it still had a significant positive impact on the mood of young people during the pandemic.

Another study (Kang et al., 2020) assessed the physical and mental health of adolescents during periods of isolation or social restrictions. The relationship between physical activity and sedentary lifestyle was explored. The questionnaire assessed the physical activity and the emotional mood of young people. The Mann-Whitney V and Kruskal-Wallis scales were used to assess the differences between the physical activity and the emotional mood of young people according to sex. The results showed an average of 12 minutes of activity and over 350 minutes of daily sedentary lifestyle. Emotional disorders were lower in boys than in girls. In conclusion, the study shows that adolescents had a sedentary lifestyle during the period determined by quarantine/isolation, whereas girls were more affected in terms of emotional mood.

In his study (Chen et al., 2018) Chen aimed at investigating the prevalence of physical activity and the analysis of sedentary behavior in young people aged 10–18 and also at evaluating the connection of the two parameters with age and sex. Also, physical activity and sedentary behavior were assessed according to the questionnaire.

Boys were more physically active whereas girls were less sedentary. Physical activity and sedentary behavior decreased according to the age, especially in girls. So even before the pandemic, there were changes in the lifestyle of young people.

Physical activity was also assessed in students.

Romero-Blanco, Rodríguez-Almagro, Onieva-Zafra, & Parra-Fernández, (2020) assessed students' physical activity and sedentary behavior before the pandemic and during quarantine and isolation. There was an increase in the physical activity and in

the sedentary period, but the results depended on sex, age, body mass index, alcohol consumption, smoking, diet, and anxiety/depression.

The COVID-19 pandemic is a public health problem that influences the economic, political, and scientific fields of the world.

Olaimat, Aolyamat, Elshahoryi, Shahbaz, & Holley, 2020 assessed the attitudes, anxiety, and behavioral practices of Iranian students during their isolation period by using an online questionnaire. It was found that two thirds of the students understood the severity of COVID-19, prevention measures, isolation, and physical distance. Students, regardless of age, especially the ones in medicine, have experienced increased adequate behavior in comparison to students in other faculties. On the other hand, the study discusses elements of respiratory gymnastics for prophylactic and curative purposes but also the improvement of the lifestyle.

After the quarantine in March 2020 in various countries, more than 3 billion people have been isolated as a result of the COVID-19 pandemic. In a study published in September 2020 (Flaudias, Iceta, Zerhouni, Rodgers, & Billieux, 2020), Flaudias pointed out the relationship between the stress caused by isolation and the change in eating behavior in over 50,000 French students during the first 7 isolation days. The online questionnaire filled included elements about the mood of these students, the level of stress determined by isolation and physical distance, excessive food consumption, and possible dietary restrictions on the first 7 isolation days. The results show the association of over-eating, female sex, dissatisfaction with body image, and changes in eating behavior.

12.2 Lockdown in Romania determined by COVID-19

The lockdown in Romania, established on March 16, 2020, caused by the COVID-19 pandemic, had an influence on the health conditions of the population, regardless of age group. Even though in the beginning of the pandemic, the elderly were the most affected (Liu, Chen, Lin, & Han, 2020), it was found along the way that the virus also affects young people (Imam, Odish, & Gill, 2020).

12.2.1 Influence of the lockdown upon youth/students

For young people, regular physical activity helps them reduce stress and tone the muscles of the body, especially the respiratory ones, so that they cope more easily with the inflammatory process triggered by the virus SARS-CoV-2 (Feng, Tuchman, Denninger, Fricchione, & Yeung, 2020).

During the lockdown and later during the alert state, the students carried out their scientific/academic activity in the online environment. In this context, the reduction of physical activity has led to the impairment of physical, motor, and sensory capacities.

From the motor point of view, the ability, coordination, control decreased, and from the psychosensitive point of view, there were changes in emotional states, intense

anxiety states, worsened by the information in the media, and insecurity regarding the data about the virus.

On the other hand, muscle contractions and static and dynamic balance were influenced, regardless of age. It was not possible to do outdoor exercises to maintain basic motor skills (walking, balance, and running). The latter can be maintained only through continuous physical activities, which could not be achieved during quarantine or lockdown/alert periods.

Coordination and control skills were influenced, too, even the simple motor actions that involved segments of the body or the whole body. For the students from our university (from the Physical Education Department or from the Health Department), this period meant the reduction of the physical activity and the decrease of the specific ability of the sport they practiced (Leuciuc, 2015).

12.2.2 Influence of the lockdown upon youth/students with disabilities

For students who were known to have various disabilities (scoliosis, kyphosis, low back pain, visual disturbances), this period of inactivity worsened pain symptoms, especially cervical and lumbar localization, by taking into account the context of online academic activity because students spent about 12 hours daily on the computer/laptop in a sitting, extended position.

On the one hand, this position worsened the pain, but also continued the deficient positions within the vertebral static disorders. Then, the prolonged sitting position had an effect on the circulatory system (by emphasizing stasis in the lower limbs), on the respiratory system (the position of the thorax), and on the visual analyzer (fatigue and impaired visual acuity).

The lack of long-term physical activity and continuous academic activities over long periods in a day was also correlated with diet. This was influenced in the sense of consuming certain types of food that would require energy consumption to prevent the accumulation of calories. The fluid intake was influenced during this period, too. Diet and hydration should have been a support for intellectual and physical activities, and maintaining health.

12.3 Importance and the prophylactic role of physical exercises

In this context, the prophylactic role of regular physical exercise and of the diet corresponding to the type of effort performed, in order to reduce the risk of disease, is highlighted once again. Thirty minutes of physical exercise should be done each day.

If a person has good health conditions, with a proper physical and mental state, we discuss the notion of primary prophylaxis, which consists of maintaining the best health conditions.

People who already have pathology or who can prevent the appearance of pathology fall into the category of secondary prophylaxis. It is also necessary to recommend daily physical activities for 30 minutes. Physical exercise in the prophylactic program has several objectives (Sbenghe, 1987):

1. increased joint mobility;
2. increased muscle strength;
3. increased muscular and general resistance;
4. maintaining the correct alignment at the level of body segments;
5. maintaining a correct posture of the whole body;
6. increasing the coordination of movements;
7. increasing the effort capacity for adapting the body to various demands.

These exercises are done with progressive intensity, with speed and rhythm of execution adapted to the particular features of each individual and clinical–functional status (Cordun, 1999).

Exercise is functional fatigue that can cause a change in the body's homeostasis, in order to cover the increased metabolic needs of its major functions. This is why it must be supported by an adequate diet from a quantitative and qualitative point of view that should cover the energy needs useful for doing these activities (Leuciuc, 2019).

12.4 Nutrition and physical activities

Magnesium is an important nutrient for the body, with a role in preventing and treating pathologies. About 30%–40% of the total amount of magnesium in the human body is found in muscles and soft tissues, 1% is in the skeleton, a small amount is in plasma, and about 60% is found in bones. Along with calcium, sodium, and potassium ions, magnesium ions regulate the blood-clotting mechanism and the neuromuscular excitability.

On the other hand, magnesium is involved in energy metabolism, in synthesis of protein, deoxyribonucleic acid, and ribonucleic acid, in glucose homeostasis, and in mineral metabolism.

The decrease in the amount of magnesium in the blood can cause the disruption of the activities of some enzymes and the development of certain metabolisms. The consequences are irritability, nervousness, lack of concentration, changes in heart rate and in the normal activity of the heart, and the occurrence of high blood pressure. Poor nutrition, without ensuring an adequate intake of calcium and magnesium, has been influenced by the ability to contract muscle, strength, and muscle coordination (Antonescu et al., 2018).

An important role of exercise is to maintain an optimal calcium–magnesium ratio in the body's skeleton, taking into account that it contains about 99% of the total calcium. The rest of the calcium is found in plasma and extravascular fluid. In addition,

calcium and magnesium have a role in muscle contraction. The normal reference range for these ions takes into account age, sex, diet, climate, and season (the pandemic period in our country included spring and summer) (Antonescu, Totan, Boitor, Szakacs, & Silisteanu, 2017).

Even if no effort is made, the body consumes energy daily to maintain life, and this amount of energy is called basal metabolism (1 calorie/kg body weight/hour). Moderate physical activity means an effort that can induce a caloric consumption of 3.5–7 kcal/minute and that maintains the heart rate at 60%–73% of maximum.

Caloric consumption can vary according to the effort (type, intensity, difficulty degree) from 75–100 kcal/hour in minimum physical activities to 300–500 kcal/hour for high intensity activities.

The diet must be complex, in order to ensure the balance between intake/consumption, and in order to maintain good health conditions and a good body weight (implicitly of the body mass index) at the optimal value (Leuciuc, 2019).

On the other hand, in a study (Martinez-Ferran, de la Guía-Galipienso, Sanchis-Gomar, & Pareja-Galeano, 2020) published in May 2020, Ferran assessed the effects of a sedentary lifestyle, the impact of a relatively short period of sudden reduced physical activity and overeating during the quarantine period, effects that will appear soon.

The impact on health is given by the reduction of physical activity and of walking, to which adds to the change of eating habits. These factors will lead to changes in body composition with an increase in body fat, abdominal fat, inflammatory cytokines, and subsequently, over time, the development of metabolic syndrome with the risk of developing chronic diseases. A regular or possibly increased food intake, but with the reduction of energy costs is the starting point for an imbalance that can affect the people's health.

In this context, it is important to restrict the caloric intake, caused by physical inactivity.

A dietary profile, especially in adolescents who are extremely sensitive to poor eating habits, has been implemented by the COVID-19 pandemic (Ruiz-Roso, Carvalho Padilha, Mantilla-Escalante, & Ulloa, 2020).

Based on the questionnaire, the eating habits of over 800 adolescents from five countries were assessed. There was an increased consumption of inadequate food, and serving of meals while watching shows on TV, phone, or laptop. The influence of sex, family, and school education on nutrition was noted.

During the pandemic, the nutritional behavior was analyzed and the connection between an inadequate dietary intake and the reduction of physical activity was pointed out.

The young people who had a sedentary lifestyle, reduced physical activity, increased food consumption with the influence of body weight, and also vices (smoking, alcohol consumption, even occasionally) had negative repercussions at the physical and emotional level. Exercising regularly can ensure an optimal body mass index.

Nutrition is the basis of energy supply for all forms of physical activity. The main objectives are to continue nutritional health and to meet needs. This is why the nutritional diet should be balanced, with a controlled body mass index and body composition.

Another important nutrient in achieving physical performance is water. A loss of 1% of body weight can negatively influence concentration, motivation, and performance, whereas a loss of 2%–3% of body weight causes a decrease in the exercise capacity.

12.5 Physical exercises

Young people should be aware of the importance to be healthy and the value of physical activity has implications for changes in the quality of life and lifestyle (Silisteanu & Covașă, 2015).

In the context created by the pandemic, it is necessary to find solutions to practice physical exercise at home, regardless of the age group (Goethals et al., 2020).

For the students from the sports and health departments of our university, exercises have been designed according to age (we have students aged 19–45), sex, motor skills, possible disabilities, physical capacity, and adaptation to effort.

The diet must be complete and adapted to the type of effort and the exercise done.

The benefits of exercising can be summarized as follows:

1. increases the degree of mobility in the joints;
2. increases contractility and elasticity of the muscles involved in exercise;
3. increases muscle strength and endurance, but also general strength;
4. increases ability and coordination;
5. improves static and dynamic balance;
6. maintains good functioning of the cardiovascular and respiratory systems; and
7. maintains good mental and emotional state.

12.5.1 Modalities of doing physical exercises correlated to respiratory gymnastics

The students received online indications to do some exercises at home, as follows:

1. The orthostatic position is used for heating. This is a favorable position for breathing.
 - a. *Breathing* can be favored if the support base is increased by moving the legs apart (a derived position). If the students work with a slightly extended torso, inspiration is favored, whereas by slight flexion, expiration is favored. The lateral inclined positions provide an asymmetrical breathing and enable the opposite side of the inclination, it is useful especially in vertebral static disorders (scoliosis). Breathing performed from the orthostatic position with slight flexion of the torso and the palms supported previously is maximum.

Extensive and deep inspiration can be achieved by determining the extensor muscular contraction of the neck and back, approaching and fixing the

shoulder blades, straightening the head and implicitly correcting the position of the spine, especially in the cervical region and upper back. This part of the breathing, the inspiration, also trains the abdominal muscles.

On the other hand, deep exhalation determines the return of the spine to the initial position, the removal of the shoulder blades and the relaxation of the inspiratory muscles.

Breathing exercises may be accompanied by active movements of the upper limbs. In order to continue the positions and do the movements, it is necessary to have the static and the dynamic contraction of the muscles of the back, thorax, shoulders, and shoulder blades. For better results, during the exercises students can practice the action of traction and pressure, contraction and relaxation on the chest, which aims at enabling or on the contrary hindering breathing.

By fixing the hands on the shoulders, on the hips, or at the nape of the neck, the accessory respiratory muscles, especially the inspiratory ones, will contract more strongly and will widen the thoracic box, thus increasing the ventilation at the lung level.

The movements performed with the upper limbs can be performed from standing, sitting, lying down, or kneeling position.

Abduction of the upper limbs enables inspiration whereas adduction enables expiration.

The movements with the upper limbs can be made from the standing, sitting, lying down, or kneeling position.

It is considered that some breathing exercises that are accompanied by torso movements would be more effective than those performed with the upper limbs. The extensor movements of the torso widen the thorax and enable the inspiration, whereas the flexion of the torso enables the expiration. The lateral inclination movements will enable the inspiration on the convex side, whereas the expiration will enable the concave side.

For the lower limbs, walking and easy running are used.

b. *Proper warm-up exercises:*

- i.** Active mobilization of the upper limbs in the orthostatic position.
- ii.** Execution of head movements in physiological directions: flexion, extension, lateral inclinations, rotations.
- iii.** Free trunk mobilizations: flexion, extension, right/left tilt, rotations.
- iv.** Active mobilizations of the lower limbs: squats (anterior, lateral), one knee to the chest.
- v.** Slight jumps on the spot, first with the lower limbs close and the upper limbs next to the trunk, then with the lower limbs apart and abduction exercises of the upper limbs.
- vi.** Slight knee bends.

vii. By putting the hands on the chest during breathing, the respiratory muscles are toned and the muscular resistance is increased.

2. Doing exercises

a. *From supine position:*

i. Breathing muscles are relaxed, so the position is favorable for resting breathing, not for intense breathing

ii. *Exercises:*

- Bending the knee and bringing it to the chest, on inspiration and positioning, and returning to the initial position, on expiration.
- Vertical shearing of the lower limbs at 90 degrees and then after a few days, at 60, 45, and 30 degrees (depending on mobility, motor ability, and degree of physical training).
- Alternately lift one upper limb as high as possible and stretch the knee very well.
- The horizontal bike is done.
- Flexing the knee and touching it with the opposite upper limb.
- With the arms crossed on the chest, the knees are flexed and the head is flexed, touching the sternum with the chin, positioning and returning.
- To increase respiratory capacity, students can apply resistance on the abdomen (a book).

b. *From prone position:*

i. Breathing is slightly obstructed, not wide. This is why the trunk is extended and the position is supported on the palms or elbows to enable breathing.

ii. *Exercises:*

- Lifting (extending) the head with support on the lower limbs.
- Grabbing the ankles with the hands and achieving the trunk extension.

c. *From lateral decubitus:*

i. Breathing is especially favorable for the unsupported hemithorax, whereas the diaphragm is pushed towards the thorax by the viscera in the part of the supported hemithorax.

ii. *Exercises*

- Lift the free lower limb and extend it to 30, 45, 60, and 90 degrees.
- Flexion of the free lower limb and touch the ground with the knee.

d. *From the seated position:*

i. Breathing is favorable if a correct position of the torso is maintained, with the head raised and the chest pushed forward. By the exercises done from a sitting position with the lower limbs stretched, by shortening the abdominals and kyphosis of the dorsal region of the back, the breathing is influenced but the exercises are not qualitative (except for athletes). If the

exercise is done from the sitting position, the breathing is relaxing, calm, with the increase of the duration of the respiratory pause.

- ii. Exercises
 - Knees removed, bend the anterior torso and try to touch the ground under the chair with the fingertips.
- e. *From the knee position:*
 - i. Breathing is wide if starting from the derived position, respectively quadruped, because the support made on the palms allows the contraction of the scapular belt muscles and helps breathing, exercises increasing the antero-posterior and lateral thoracic diameters
 - ii. Exercises
 - Support on the knees, perform an isometric abdominal contraction (pull strongly inwards the abdominal wall) with a duration of 5–6 seconds and relaxation of 12–15 seconds.

Each of these exercises should be repeated 4–8 or even 10 times, in a set of 1–2 sets with relaxation breaks and breathing exercises.

After each set of exercises, it is recommended to shake each upper and lower limb, in order to achieve muscle relaxation.

12.5.2 Prophylactic role of respiratory gymnastics

Exercise must be correlated with breathing, which is very important.

Focusing on breathing is a simple way to regulate emotional states and reduce anxiety caused by physical and social constraints (Feng, Tuchman, Denninger, Fricchione, & Yeung, 2020).

Breathing exercises can help students and young people to control respiratory function, and on the other hand to circulate a larger amount of air in the lungs, increasing the diameters of the thoracic–anteroposterior, transverse, and vertical cavities.

Students were also instructed to perform breathing exercises with peripheral resistance such as filling a balloon with air or scattering flakes.

Also, in order to keep functional breathing, one can use breathing exercises that can be accompanied by phonetic manifestations (pronunciation of vowels, syllables, words or sentences on expiration, reading aloud) and music (choruses of some songs).

Breathing exercises involve a broad base to support the body, a stable and symmetrical position. For cases of vertebral static disorders, when pursuing corrective purposes and an uneven development of the two halves of the chest, asymmetrical positions can also be used.

The students also took into account a few recommendations, namely, the inspiration should be made only via the nose, possibly through one nostril, alternating, in fresh air at a comfortable temperature. Exhale only via the mouth.

For students who have been diagnosed with static disorders with low back pain, breathing exercises from the sitting position are recommended to encourage inspiration and expiration.

Performing physical activity 2–3 times a week allows an increase in the quality of life with improved functional status and lifestyle.

We believe that a daily or at least 2–3 times a week running exercise program, especially during quarantine/lockdown/alert, along with an adequate diet, can help students to overcome physically and emotionally this pandemic period. Exercise programs must be permanently accompanied by elements of respiratory gymnastics with a particularly prophylactic character in order to prevent the occurrence of any ailments at the upper respiratory tract.

Students should be encouraged to do controlled exercises, to have a diet appropriate to their health and to observe all hygiene measures and to rest during the COVID-19 pandemic.

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