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Coronavirus disease 2019 Pandemic as a threat for bone health

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ABSTRACT

Objective: The worldwide predominance of coronavirus disease 2019 (COVID-19) pandemic will have tremendous consequences on bone health of the general population and specifically to the bone mineral density of both young and elderly adolescents, due to sedentary lifestyle resulting from the prolonged and repeated lockdown. Scientific articles argue about the short and long term consequences on bone health resulting from the social isolation and the subsequent sedentary behaviors, whereas experts focus their scientific interest at guidelines for diagnosis, management and prevention of osteoporosis in the era of the COVID-19 pandemic.

Keywords: pandemic, sedentary lifestyle, lockdown, osteoporosis, bone health, COVID-19

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which was first reported in the end of 2019 in Wuhan, China. This newly diagnosed disease is characterized by fever, respiratory symptoms as well as fatigue, myalgia, dizziness and delirium, and its rapid spread worldwide caused a pandemic (**1**). Most countries, under the guidance of World Health Organization (WHO), in order to control the spread of this fatal disease, applied different measures such as quarantine, social distancing, isolation of infected individuals, closure of schools and all leisure and cultural facilities (**2-4**). All these massive public health interventions which have been implemented to control the outbreak, widely named as “lockdown”, had tremendous effects on peoples mental and physical health, caused stress, social isolation and degraded the quality of their lives resulting in a range of chronic health conditions (**5**).

During the COVID-19 pandemic several studies from different countries have investigated the characteristics and impact of sedentary lifestyle during the lockdown. It was unanimous that, during this pandemic, young adults demonstrated low physical activity (PA), high sedentary behavior (SB) (including leisure screen time), and long sleep duration, on discordance to the World Health Organization (WHO) guidelines (**2-4**). As WHO classified physical inactivity as the fourth leading risk factor accounting for 6% of global mortality (after hypertension - 13%, smoking - 9% and diabetes - 6%), this pattern of sedentary lifestyle during the COVID-19 pandemic assists the development of population specific health education and behavior interventions by the public health practitioners (**6, 2-4**).

COVID-19 and OSTEOPOROSIS

Osteoporosis is a chronic metabolic disease characterized by low bone mass density which reflects to enhanced bone fragility and associated increased risk for fractures.

While physical activity is one of the most important factors to maintain mass, on the other hand, physical inactivity is a predisposing factor for accelerated bone loss and future automatic fractures (**7-8**).

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The worldwide predomination of COVID-19 pandemic will have tremendous consequences on bone health of the general population and specifically to the mineral density of both young and elderly adolescents, due to sedentary lifestyle resulting from the prolonged and repeated lockdown. It is expected that it might increase the relevant risk for osteoporotic fragility fractures and the subsequent healthcare costs, morbidity and mortality. Thus, reduced physical activity due to the COVID-19 stay-at-home order may also affect the bone health of patients with known osteoporosis, either by imposing the sedentary lifestyle, or by setting burdens in the provision of health care (**7-8**). For the moment only a few preliminary studies have proved laboratory or radiographically the effects of immobilization during the lockdown on bone mineral density, indicating that significantly lower serum bone alkaline phosphatase (BAP) concentrations were found in patients receiving anti-osteoporotic treatment after short term lockdown, whereas the bone mineral density (BMD) remained unchangeable (**7**).

Many scientific articles have stressed the need of social intervention politics on prevention of the potential bone loss, during the COVID-19 pandemic, on patients with osteoporosis. Experimental studies investigated the percentage of decrease on human mobility during the lockdown, which was found diminished by around 50% and estimated the subsequent reduction in bone density scanning and the respective increase on fracture risk. Although past studies including patients with long-term rest reported the reduction of BMD and early increase of bone metabolic markers after 60 days of immobilization, recent studies during the COVID-19 era showed that short period of sedentary life (e.g. 39 days of lockdown) had no significant effect on bone metabolic markers especially in the elderly individuals with osteoporosis which continued their medication. Furthermore, it is remarkable that short-term sedentary lifestyle affects predominantly the young people (23±3 years), than the older men, increasing their bone resorption markers (**7, 8**). While preliminary studies showed that bone health is retained during a short period of immobilization, thus prolonged or repeated social isolation periods can harm, even those who continue their therapy. Patients with osteoporosis are encouraged to follow low-energy aerobic exercise programs individually at home in order to maintain their muscle mass and strength, balance, posture, to reduce the risk of falls and improve their quality of life (**9-11**).

Covid-19 and Falls – fractures

COVID-19 disease, and its associated symptoms of fatigue, dizziness and delirium, could contribute to falls and fractures among older people, but so far this hypothesis lacks research data. On the other hand, it remains yet unclear whether the restriction by the lockdown may affect the incidence of osteoporotic fragility fractures, due to reducing the number of outdoor falls and subsequent fractures among older adults (**1, 12-14**). For the moment, the effect of restriction of outdoor activities is more pronounced on the decrease of non-hip fragility fractures (including the forearm, upper arm, ankle, foot and others), compared with hip fractures, as more frequently the non-hip fractures occur outdoors whereas usually, the hip fractures occur indoors and in older people (**12–13**). A large observational study, during the lockdown, proved that fewer outpatients attended the Fracture Clinic, for non-hip fractures, whereas there was no change in admissions for hip fractures (**2**). This finding could be attributed to fewer outdoors falls, during lockdown especially on winter months, when the incidence of both types of fractures was higher (**8, 15).**

Covid-19 and osteoporosis management

Bone mineral density (BMD) imaging examinations in specialized diagnostic centers during lockdown might temporarily be postponed and fracture risk stratification for non-diagnosed individuals can instead be performed using the Fracture Risk Assessment Tool (FRAX) (**16**).

In a newly diagnosed osteoporotic patient therapy (especially oral regiments) can be initiated via teleconference especially in individuals with high-risk scores, like patients with recent osteoporotic fragility fracture or patients taking chronic high-dose glucocorticoids. Those patients should perform a few pretreatment laboratory studies, e.g serum calcium, creatinine, and/or 25-hydroxyvitamin D, before the first prescription of potent antiresorptive agents {intravenous (iv) bisphosphonates and denosumab} to avoid hypocalcemia. However, several studies suggest a temporary subscription of oral bisphosphonate for patients with osteoporosis because intravenous administration of these medications requires clinical intervention and self-presence (**17**).

In the era of COVID-19 pandemic the appropriate anti-osteoporotic medication should start during the hospitalization of healing fractures, because after discharge from the hospital the approach of health services for osteoporosis follow-up appointment might be difficult (18). It should be acknowledged, however, that > 50% of individuals after an intravenous bisphosphonate infusion face a flu-like reaction (fever, myalgias), which might complicate the diagnosis and be misunderstood as COVID-19 disease especially in hospitalized patients (**18-19**). Furthermore, the pandemic of COVID-19 might pose obstacles on follow-up management of osteoporosis, so patients who already receive bisphosphonates should be encouraged to continue their current treatment, even nonsufficient, because of the significantly greater risk of new fractures in case of drug intermission (**20-21**).

Although there is no evidence that therapy against osteoporosis predisposes to COVID-19 illness, or increases the risk or its severity or alters the COVID-19 disease course, however in case of early signals of this pandemic disease, the anti-osteoporotic hormonal medication should be temporarily discontinued, due to moderately increased risk for hypercoagulable complications (**22-23**). On the contrary, other experts suggest to continue denosumab and all other antiosteoporotic treatments during COVID-19 pandemic and consequent lockdown, despite the higher incidence of side effects from the first one regarding ear, nose, and throat infections, in order to prevent the risk of fractures and the subsequent comorbidities which can finally predispose to COVID-19 disease (**24 -29**).

COVID-19 and osteoporosis prevention

During 2020, the WHO released accurate guidelines which highlight the importance of regularly undertaking both aerobic and muscle-strengthening activities for all age groups

and suggest the reduce of the sedentary lifestyle. Those guidelines are intended for people in self-quarantine without any symptoms or diagnosis of acute respiratory illness, containing practical advices on relevant activities for how to spend the lockdown indoors and stay fit. WHO recommends that all adults should undertake 150–300min of moderate-intensity (MPA), or 75–150min of vigorous-intensity physical activity (VPA), or combination of moderate-intensity and vigorous-intensity aerobic physical activity (MVPA) per week at home, with no special equipment and with limited space (**26, 30-31**).

CONCLUSION

The worldwide predominance of COVID-19 pandemic will have tremendous consequences on bone health of the general population and specifically to bone mineral density of both young and elderly adolescents, due to sedentary lifestyle resulting from the prolonged and repeated lockdown. This short review concluded that current scientific articles argue about the short and long term consequences on bone health due to social isolation and the subsequent sedentary behaviors. Another hot topic for the scientific community is the management and prevention of osteoporosis during the COVID-19 era..

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