POSTMENOPAUSAL OSTEOPOROSIS AND PHYSICAL CONDITION AFTER THE SARS-CoV-2 PANDEMIC

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Abstract

Osteoporosis is a condition that leads to decreased bone mineral density. The purpose of this article is to record the evolution of muscle strength in the upper limbs among women with osteopenia / postmenopausal osteoporosis, one year after the onset of the pandemic caused by COVID-19. Forty-four sedentary women with osteopenia or postmenopausal osteoporosis (53.9 ± 3.9 years) were included in the study. The measurement of muscle strength was performed through the Arm Curl test, the subjects being familiar with this test, because at the end of 2019, the same subjects performed the initial test. At the end of the study, there was a significant decrease in muscle strength in the upper limbs, $p < .001$. Also, a correlation was observed between the patients' age and the initial test ($r = -.62$, $p < .001$) and the final test ($r = -.58$, $p < .001$).

Introduction

Osteoporosis is a systemic skeletal condition characterized by decreased bone mass and damage to the microarchitecture of bone tissue [3], [7], [13]. Osteoporosis affects millions of people around the world, being more common among women, where the incidence is much higher after the onset of menopausal [1], [9], [11], [16]. Spinal bone mineral density decreases throughout life and other authors have found that at least 50% of women's trabecular bone mass is lost before menopause [14]. With increasing life expectancy and an aging population worldwide, osteoporosis has become a major public health concern, affecting millions of individuals, especially older women in the postmenopausal period [15]. Hormones, lifestyle, body composition, alcohol consumption, medications used, vitamin D deficiency, calcium deficiency, liver and kidney disease, smoking, hyperparathyroidism, hyperthyroidism, cardiovascular disease, diabetes, all are risk factors for osteoporosis. People diagnosed with osteoporosis often experience muscle weakness, poor balance and postural deformity [5], [10], [6].

Decreased height is not only an important predictor of bone mineral density in the femur and spine among the elderly, but it is also an important indicator of the presence of vertebral fractures due to osteoporosis. Patients with osteoporosis may experience extensive pain throughout the body, weight loss, severe thoracic kyphosis, fractures and other clinical symptoms that may compromise the quality of life in these patients [12]. Osteoporotic fractures are most commonly found in the thoracic and lumbosacral spine, the distal area of the radius, the hip and the proximal area of the humerus. These fractures may occur as a result of minor trauma or may result spontaneously in the absence of the traumatic factor. If it is associated with a fall, this fall usually occurs at the level of the person's height or at a lower height [2]. Fractures can be the result of accelerated bone remodeling, which increases bone loss and subsequently contributes to decreased bone strength. Fractures can also cause a decrease in muscle strength. Muscle strength causes changes in the bone, such as its density, strength and microarchitecture [4].

Material-method

Forty-four sedentary women with osteopenia or postmenopausal osteoporosis (53.9 ± 3.9 years) were included in the study. They were presented with the test to be performed, then, after heating for 15 minutes, they performed the Arm Curl test. From sitting on the chair, the subject holds in his hand a 2.5 kg dumbbell with which he must perform as many repetitions as possible for a period of 30 seconds. These tests were performed in 2019, on the occasion of another study in which women were included. Thus, after 1 year, these tests were repeated to observe the impact of the pandemic on the muscle strength in the arms. Parametric t test was used to determine if there were changes between the initial test and the final test. Cohen's D effect size was also calculated and reported, is to refer to effect sizes as small ($d = 0.2$), medium ($d = 0.5$), and large ($d = 0.8$). The Pearson correlation was used to analyze whether there are correlations between patient age and motor performance.

Results and discussions

As can be seen from Table 1, the smallest decrease in muscle strength was 4.35%, and the most obvious decrease in muscle strength was 9.47%.

Table 1. Baseline and Final Results For Arm Curl Test

Subject	Age (years)	Baseline (reps.)	Final (reps.)	Δ%
1	51	22	20	-9.09
2	50	23	21	-8.70
3	52	22	20	-9.09
4	54	21	19	-9.52
5	59	18	16	-11.11
6	59	22	21	-4.55
7	57	22	20	-9.09
8	50	23	21	-8.70
9	50	23	21	-8.70
10	51	23	21	-8.70
11	44	23	22	-4.35
12	51	23	21	-8.70
13	50	22	20	-9.09
14	48	19	17	-10.53
15	55	20	19	-5.00
16	51	21	19	-9.52
17	53	23	20	-13.04
18	59	22	19	-13.64
19	52	23	21	-8.70
20	51	23	21	-8.70
21	53	21	20	-4.76
22	57	18	17	-5.56
23	55	22	20	-9.09
24	57	22	21	-4.55
25	59	16	15	-6.25
26	57	19	18	-5.26
27	55	22	20	-9.09
28	55	22	19	-13.64
29	58	19	17	-10.53
30	60	17	15	-11.76
31	52	21	20	-4.76
32	51	21	18	-14.29
33	52	21	17	-19.05
34	51	21	18	-14.29
35	52	22	19	-13.64
36	58	20	18	-10.00
37	58	19	17	-10.53
38	60	17	15	-11.76
39	50	20	18	-10.00
40	59	17	15	-11.76

After one year, the muscle strength at the arm level decreased by -9.46%, the difference being statistically significant, $t_{(39)} = 17.91$, $p < .001$, 95% CI [1.75, 2.19], $d = 2.83$, which may suggest the fact that the lack of movement during the pandemic influenced the muscle mass in the upper limbs.

Table 2. Descriptive Statistics Regarding The Baseline And Final Results For Arm Curl Test

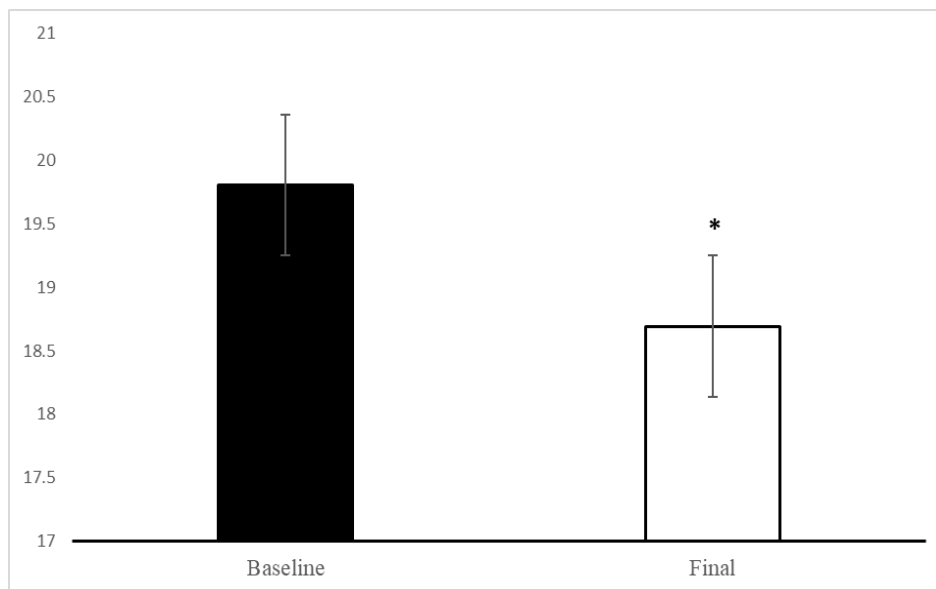|	Baseline	Final
Range	7	7
Minimum	16	15
Maximum	23	22
Mean	20.87	18.90
Std. Deviation	2	1.97
Variance	4.01	3.88

Figure 1. Baseline and Final Results For Arm Curl Test. Symbol (*) indicates intra-group difference (p < .001).

Also, there was a negative correlation between the patients' age and the results obtained both at the initial testing, statistically significant correlation, $r = -.62$, $p < .001$, and at the final testing, $r = -.58$, $p < .001$.

Conclusion

In conclusion, lack of exercise and aging can lead to decreased muscle strength in the upper limbs. We cannot know exactly whether in our study this is caused by aging or the effects of the pandemic on physical activity.

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