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Impact of a program of adapted physical activity on the morphological, physiological, and biological parameters of sedentary hypertensive postmenopausal women

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Abstract

High blood pressure is a public health problem. It has a detrimental impact on the health system and physical activity is part of the arsenal of its treatment. The aim is to contribute to the improvement of the management of hypertensive patients in our environment. We conducted a quasi-experimental study on a total of 30 hypertensive postmenopausal women followed at the University Clinics of Kinshasa over a 6-month period. Morphological, physiological and biological parameters were assessed before these patients were subjected to the moderate intensity adapted physical activity program, lasting at least 45 minutes per session and frequency of 3 times per week plus home training. The average age of 30 patients was 56 years. After the intervention program, our study revealed a significant decrease in weight of 3 kg, body mass index of 5.1 kg/m2, systolic blood pressure of 4.4 mmHg, resting heart rate 3.3 bpm and blood sugar of 3.5 mg/dL. In addition, a significant rise of 3.31 mg/dL of HDL cholesterol and 2.7 ml/kg/min of V02max were observed. adapted physical activities practiced on a regular basis allow postmenopausal women with hypertension to modify certain morphological, physiological and biological parameters. They should therefore be encouraged to help postmenopausal women control their blood pressure levels and be active.

Keywords. Adapted physical activity, woman, high blood pressure, menopause.

Introduction

Cardiovascular disease is among the leading cause of death in women and high blood pressure (hypertension) is a major risk factor due to its high prevalence (Mancia et al., 2007). High blood pressure is one of the most frequent risk factors for cardiovascular mortality and morbidity and affects a significant portion of the population. It is one of the most common medical disorders: its worldwide prevalence is around 25% and is expected to increase to 29% by 2025. It is estimated that around 7.1 million deaths per year could be attributable to hypertension (Kearney et al., 2005; Girerd, 2009). Men and women have important differences in the physiological mechanisms of blood pressure control. Some conditions that promote hypertension, such as menopause, pre-eclampsia and taking oral contraceptives, are only found in women (Pescatello et al., 2004). In addition, women are less active than men. In high-income countries 26% of men and 35% of women were not physically active enough, compared to 12% of men and 24% of women in low-income countries like the Democratic Republic of Congo (DRC). After menopause, the prevalence of high blood pressure in women increases and quickly reaches that of men, even surpassing it from the seventh decade.

The World Health Organization suggests that the relationship between sedentary lifestyle and hypertension is so strong and all the learned societies of cardiology or sports medicine recommend increased physical activity as a first line intervention to prevent or treat hypertensive patients (Pescatello et al., 2003). For a long time, women have been under-represented in clinical research. For the past

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ten years or so, the scientific community has become more interested in the role of sex in the physiology, pathophysiology of certain diseases (Pescatello & Kulikowich, 2017). Indeed, we have observed in our community that in the management of arterial hypertension the emphasis is much more on drug therapy and no importance is given to non-drug treatment including the practice of physical activities as recommended. by the World Health Organization (WHO) (MacDonald, 2002). In addition, the studies conducted in our community are not interested in evaluating the effects of physical activity in postmenopausal women with high blood pressure. It is for this reason that we have motivated ourselves to conduct this research.

Methods

We conducted an interventional, quasi-experimental study from July 15, 2021 to January 15, 2022 at the Department of Physical Medicine and Rehabilitation (MPR) of the University Clinics of Kinshasa (CUK). The patients included in this study were adults whose mean age was 56 years postmenopausal, admitted with high blood pressure to the above-mentioned Department.

Sample

The sample for the present study consisted of 30 postmenopausal women with hypertension followed in the Department of MPR for a period of at least six months. These postmenopausal women with high blood pressure had stabilized blood pressure, no target organ damage factors, and no contraindication to physical activity.

Data collection

The data of the present research were collected from postmenopausal women with hypertension by the Kinesiologists of the Department of MPR and the Biological Doctors of the Clinical Biology Laboratory of the CUK.

Morphological parameters

• Weight (kg): It was measured on the basis of the SECA brand balance calibrated in kilograms (kg) with an accuracy of 100 mg; the subject standing, barefoot and lightly dressed.

• Height (cm): It was taken using a SECA brand measuring rod, mounted on a vertical scale, the subject standing, barefoot and having removed all ornament (hat, kepi, etc.) from the head. Neck and heel against the vertical branch. The height rod ruler slides vertically on the rod support branch to the top of the head.

• Calculation of the body mass index (kg / m2)

The body mass index was calculated using the following formula: BMI = Weight (kg) / Height2 (m)

• Waist circumference (cm)

Using a tape measure, he measured himself by taking the waist measurement at waist level between the lower ribs and the top of the pelvic bones.

Physiological parameters

• Blood pressure (mmhg): With the patient seated, after at least 15 minutes of rest, the arterial pressure was measured using a mechanical blood pressure monitor on the left arm placed on the table.

• Heart rate (bpm): It was measured using a brand-name MEDISANA electronic blood pressure monitor which observed both blood pressure and heart rate.

Biochemical assessment Checks for DHL, LDL cholesterol and blood sugar were carried out before and after the intervention program at the medical biology laboratory of the University Clinics of Kinshasa by the clinical biologist.

Support protocol

The adapted physical activity program was provided by the kinesiologists of the kinesiology service of the Department of MPR of the CUK with a frequency of three times a week plus home training lasting at least 45 minutes and moderate intensity adapted according to the patient exercise tolerance. The heart rate monitor was used to monitor the heartbeat during exercise. These adapted physical activities consisted of aerobic endurance exercises including walking on a treadmill, strengthening the upper limbs on a manual ergocycle, strengthening the lower limbs on an ergometer ,and strengthening the abdominals on a mat on the floor.

Ethical considerations

This article is the result of scientific research and has not received any laboratory sponsorship. The

authors declare no conflict of interest. All authors also declare that they have read and approved the final version of the manuscript. The study was approved by the local ethical committee (DPT/MPR/244/2019).

Data analysis

Data analysis was performed with SPSS (Statiscal Package for Social Science) software version 20.0 for Windows. The results have been shown as means along with the standard deviation (SD) in the tables and figures. The difference in comparison between two means was subjected to the classic test of differential statistics. The student's t test was used to compare the mean values of the parameters measured before and after the intervention program. The statistical test significance level was set at $p < 0.05$.

Results

This figure shows that the mean age of postmenopausal women with hypertension was 56 years with a standard deviation of 4,785.

We see in the table above a significant decrease in weight of 3 kg, body mass index of 5.1 kg/m^2, systolic blood pressure of 4.4 mmHg, heart rate of 3.3 bpm, and glucose of 3.5 mg/dl on the other hand for DHL cholesterol and VO2max, an increase of 2.6 mg/dl and 2.5ml / kg/min were observed respectively.

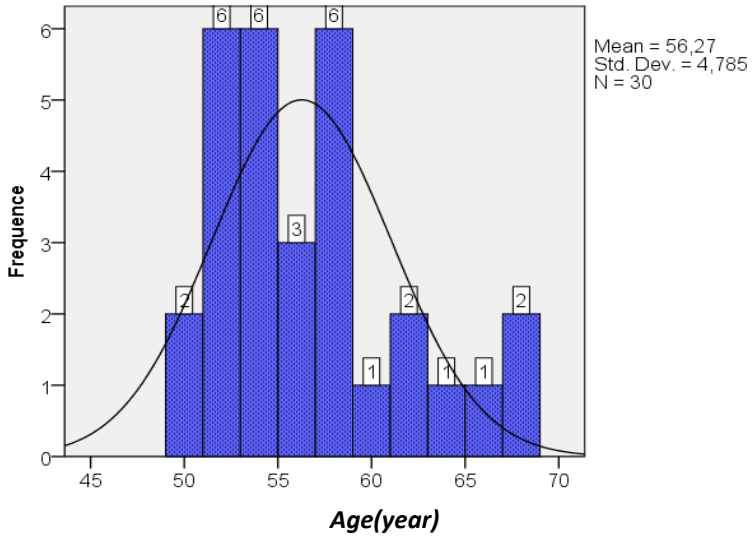

Figure 1. Mean and standard deviation of age of postmenopausal hypertensive patients.

Table 1. Comparison of the mean values of the morphological, physiological, and biological parameters before and after the program (Mean ± SD).

Parameters	Before	After	*p*
Weight (kg)	83.7 ± 7.01	80.7 ± 7.4	0.002*
Waist circumference (cm)	93.9 ± 5.9	90.4 ± 6.09	0.061
Body mass index (kg/m^2)	33.2 ± 2.6	28.1 ± 2.5	0.001*
SBP (mmhg)	145.5 ± 4.3	141.1 ± 4.1	0.001*
DBP (mmhg)	93.9 ± 2.8	92.1 ± 2.7	0.078
Heart rate (bpm)	84.7 ± 8.9	81.4 ± 8.7	0.001*
HDL cholestorl (mg/dl)	47.19 ± 5.5	50.5 ± 6.1	0.001*
LDL cholesterol (mg/dl)	126.4 ± 39.8	123.8 ± 40	0.531
Blood sugar (mg/dl)	118.3 ± 4.1	114.8 ± 4.3	0.001*
VO2max (ml/kg/min)	46.8 ± 3.0	49.5 ± 3.3	0.004*

** p <0.05, SBP: systolic blood pressure, DBP: Diastolic blood pressure.*

Discussion

Moderate or intense physical activity and cardiorespiratory training are associated with significant reductions in morbidity and mortality, in both men and women, both in the presence of arterial hypertension and other pathologies (Mancia et al., 2007).

The present study consisted of evaluating the morphological, physiological and biological parameters of postmenopausal women with hypertension whose mean age was 56 years. This observation is different from that made by Gremeaux & Sosner (2012) in Europe who showed that the average age of hypertensive patients was 74 years. This is justified by the fact that the European population is aging compared to the African population.

Regarding the morphological parameters, this study revealed that postmenopausal women with hypertension significantly modified their weight. This result is consistent with that of Bofosa et al. (2018) who demonstrated that regular physical activity involving aerobic endurance and muscle building can significantly reduce the weight of 3 kg. The effect of PA has a very strong level of evidence for preventing weight gain and maintaining weight loss. This was demonstrated in a 2000 study conducted by Tanaka et al., 2000 which consisted, after initial weight loss, in dividing patients into 4 groups according to the duration of PA performed (<150min / week, 150 at 250, from 250 to 300 and> 300 min / week). The only ones who maintained at least 10% of the weight loss were those who achieved more than 300 minutes of PA per week.

Regarding blood pressure figures, our study revealed a significant reduction in systolic blood pressure figures of 4.4 mmHg in postmenopausal hypertensive patients after the intervention program in physical activity. These results corroborate those of Cornelissen & Fagard (2005) who demonstrated that high levels of PA and better physical capacity are associated with a reduced incidence of hypertension and that aerobic training reduces resting BP in individuals with normal BP and those with hypertension. The two most recent meta-analyses show that muscle strengthening leads to a significant decrease of 3 mmHg for SBP or DBP at rest (O'Connor et al., 2007; Guo et al., 2008; Rhodes et al., 2012). Although this decrease appears clinically modest, it can be emphasized that it has been estimated that an average reduction of 3 mmHg in the general population would lead to a reduction in coronary heart disease of 5–9%, stroke 8–14%; and all-cause mortality 4% (Mancia et al., 2013; Beck et al., 2013). Regular practice of regular physical activity helps the development of heart muscles and therefore improves heart rate. The present study showed a decrease in heart rate of -3.3 bpm. This result is similar to that of Bofosa T et al (Bofosa et al., 2018) who, after monitoring a group of hypertensive hemiplegic patients, noticed a significant reduction in heart rate.

With regard to cholesterols, we observed in our study an increase in HDL cholesterol after the practice of physical activities. Gremeaux & Sosner (2012) have shown that the practice of a regular physical activity acts directly on the arteries while improving the function of the artery which will stay young longer and, consequently, secrete less substances promoting its rigidity as well as cholesterol deposits. We noticed in our study a decrease of 3.5 mg / dl in blood sugar. This result corroborates that of the systematic review and a meta-analysis by Lacombe et al. (2011) which showed that supervised exercise programs integrating aerobic or resistance exercise improved blood sugar control in adults than diet is part of the program or not.

One of the most important effects of physical activity on cardiac physiology is an increase in VO2max. We found in our study a significant increase in VO_2max of 2.7 ml/kg/min. according to Umpierre et al., (2011) AP acts on physical condition by improving cardiac and respiratory functions, in particular by increasing the VO_2 max by 11.8%. However, the level of VO_2 max is the first predictor of the occurrence of a cardiovascular event. By increasing VO_2 max, physical activity improves cardiopulmonary capacity, oxygen transport in large vessels and capillaries, and the oxidative function of mitochondria (Nualnim et al., 2012; Guimaraes et al., 2014).

Limitation

The limitation of this study is that its sample was small and did not include all biological parameters.

Conclusion

High blood pressure is a public health problem with damaging effects on health systems, the environment, public well-being and quality of life. In addition, women are at risk and particularly postmenopausal women in the context of our study. It emerges from

this study that the practice of adapted physical activities allows postmenopausal women with hypertension to improve certain morphological, physiological and biological parameters.

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