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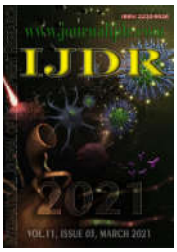

RESEARCH ARTICLE OPEN ACCESS

PHYSICAL EXERCISE IN HYPERTENSIVES AS A COST CONTROL TOOL IN PUBLIC HEALTH

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ABSTRACT

Arterial hypertension is a public health issue of great importance because it reduces life expectancy and leads to several complications, generating high financial and social costs. The adherence to treatment is the basis for controlling and decreasing chronic disease morbimortality. However, the degree of worldwide adherence in chronic treatments lies between 50% and 75%, hence the importance of devising a way of using physical exercise as a tool for disease prevention and control. Hypertension control programs still face challenges, especially with regarding to patient adherence, with consequent uncontrolled blood pressure rates and high morbimortality. This study is expected to contribute to the improvement of the information collected on the admission of patients to such programs and the selection of those who need systematic, individualized monitoring, thus reducing the exponential costs in the annual budget for public health. Study Design: The design utilized original articles, society journals, federal government guidelines, books and data collected via internet access in order to make a bibliographical review. **Clinical Relevance Statment:** The study shows the cost that hypertension brings to the Brazilian public health sectors and how much savings can be made when a simple action is implemented, that is, the stimulation of physical activity.

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INTRODUCTION

It is known for a fact that our public health is ill, and the perspective of expenditure on its maintenance is to increase over the years, partly owing to the constant technological modernization in diagnosis and treatment, associated with inefficient management. According to the International Society of Hypertension, the overwhelming margin of direct and indirect annual expenditure on the hypertensive disease is approximately ten trillion dollars all over the planet (Christensen *et al.,* 2009). Turning to Brazil, the Ministry of Health (Brasil, 2009) suggests, for the treatment of arterial hypertension in the public health system, an estimated annual cost of US $ 398.9 million, representing 1.43% of the total expenditures of the Unified Health System (SUS). Putting its complications and diabetes together, the estimated impact on the loss of work productivity and family income was US $ 4.18 billion between 2006 and 2015 (Sociedade Brasileira de Hipertensão, 2016). This piece of information is enough to search for a way of

In addition, by controlling its risk factors, the physical exercises would have a wide coverage, reaching the cases of sedentary lifestyle, obesity, smoking, diabetes mellitus, cardiovascular diseases and chronic degenerative diseases (Sociedade Brasileira de Hipertensão, 2016). Arterial hypertension means systolic pressure ≥ 140 mmHg and diastolic ≥ 90 mmHg, with ambulatory measurements following the recommendations of the project 7th Brazilian Guideline of Arterial Hypertension (Sociedade Brasileira de Hipertensão, 2016). The clinical and therapeutic management of arterial hypertension includes pharmacological measures in addition to non-pharmacological ones such as restriction in salt intake (<2g NaCl/day), smoking cessation, struggle against stress, control of body weight and physical inactivity, the latter obtained by regular physical exercises (Santos, 2005). Physical exercises play an important role in preventing morbimortality triggered not only by cardiovascular condition, but also by other diseases such as diabetes, obesity and colon and breast cancer. The American College of Sports Medicine (ACSM, 2004 apud Negrão et al., 2006) recommends the practice of

arterial hypertension (Negrão, 2006). Following the natural course of hypertensive disease, the increase of its prevalence is expected with age, which makes overwhelming the prediction of expenditure. Epidemiology shows a high prevalence of systemic arterial hypertension in around 32.5% (36 million) of the adult population; from 22% to 77% are unaware of the existence of the disease; and its control is unsatisfactory in between 10, 1% to 35.5% (Brasil, 2009; Sociedade Brasileira de Hipertensão, 2016). Some UK researchers theorize that drugs used to treat hypertension that act on the renin-angiotensin-aldosterone system (RAAS), angiotensin converting enzyme (ACE inhibitors) and angiotensin receptor blockers (ARBs), may increase susceptibility to coronaviruses (Chung, 2020). However, in a British study involving 931,022 people who received a prescription for ACE or ARBs, the use of inhibitors did not have any effect on the incidence of influenza. These associations in relation to the susceptibility to influenza may reflect mechanisms that are shared with coronavirus, including SARS-CoV-2 COVID 19 (Chung, 2020). In view of the situation presented, we propose a study that demonstrates the possibility of using guided and supervised physical exercise as a coadjutant in the treatment and prevention of hypertensive disease, with the aim of reducing costs spent in the control of systemic arterial hypertension.

MATERIALS AND METHODS

For bibliographical analysis, the study comprised original articles, society journals, federal government guidelines, books and data collected via internet access, thus producing a descriptive work that sought to identify and analyze the positive effects of physical exercise on the prevention and treatment of hypertension. It was shown that, with a single action, we could both achieve the disease control and prevention and reduce costs in the public health management.

RESULTS AND DISCUSSION

HYPERTENSION AND EFFECTS OF PHYSICAL EXERCISE: The hypertension disease is characterized by systolic blood pressure ≥ 140 mmHg and diastolic ≥ 90 mmHg. Also, worth considering are the pre-hypertensive patients, with systolic pressure between 121 and 139 mmHg and diastolic pressure from 81 to 89 mmHg, a condition that affects 32.5% of the Brazilian adult population (Sociedade Brasileira de Hipertensão, 2016). The prevalence of arterial hypertension (AH) rises with increasing age, reaching 60% of people over 60 (Sociedade Brasileira de Hipertensão, 2016). The expectation of the World Health Organization (WHO) (Sabate, 2020) is that, in 2025, there will be 226 elderly people for every 100 children up to 15 years old. With this forecast, we can deduce that the number of patients with arterial hypertension will consequently rise, with an exponential increase in expenses for its control (Sabate, 2003). The International Society of Hypertension (ISH) (Sociedade Brasileira de Hipertensão, 2016), points out that $ 500 billion is directly spent across the globe on the treatment of arterial hypertension; and 20 times this amount when indirect costs are included. In addition, the Society reports that 13.5% of all deaths worldwide are related to high blood pressure levels (Christensen, 2009). Costa et al., (2002) who devised the first estimate of the global financial burden ofuncontrolled hypertension, found a cost of 372 billion dollars with sub-optimal control of blood pressure in 2001.

Not only in rich but also in developing countries, 70% of health expenses are allocated to cover costs derived from a sedentary lifestyle such as hypertension, obesity, diabetes, and other cardiovascular diseases. From 2.4% to 9% of the total cost designed to health are related to a physical inactivity-driven disease (Milstein-Moscati, 2000). In Brazil, cardiovascular diseases are responsible for the highest number of deaths, according to data from the Mortality Information System (SIM) of the Ministry of Health (Brasil, 2009), and arterial hypertension is one of the main risk factors.According to a telephone survey about the practice of physical activity that has been carried out yearly since 2006 by the Ministry of Health (Brasil, 2019), 26 capitals and the Federal District presented data for 2009 reporting that 16.4% of adults are sedentary individuals, 25.8% of Brazilians spend three or more hours in front of the TV set, and only 15% of adults maintain an active lifestyle. With this currently worrying scenario and aware that physical activity reduces the risk of death from cardiovascular diseases by 40%, the Ministry of Health[2] has started campaigns to encourage physical exercise with the aim of preventing and treating cardiovascular diseases. The National Arterial Hypertension Program remarked a decrease in cardiovascular disease-related morbimortality in patients under medical treatment, even with the great difficulty of patient adherence. Medical treatment included changing eating habits, taking on physical activity and fighting smoking (Ghorayeb, 1999).

For a correct development of an exercise program for hypertensive patients, we must know that there is a classification of the types of hypertension; it can be mild, moderate or severe and be responsive or not to drugs and types of exercise (Sociedade Brasileira de Hipertensão, 2016). Until the last statement of the American College of Sports Medicine, there were no definitive conclusions on how the mechanisms for reducing blood pressure act after exercise, but several factors interact with hypotensive effects and include neurohumoral, vascular and structural adaptations (Ferreira Filho, 2007). The reduction of peripheral resistance, of catecholamines, the increased sensitivity to insulin and the changes in vasodilators and vasoconstrictors are some of the explanations for the antihypertensive effect of exercise. Exercises also promote angiogenesis, by increasing the blood supply to the peripheral and cardiac muscles (Negrão, 2006; Ghorayeb, 1999; Ferreira Filho, 2007; Micheli, 2012).

The effects of the exercises can be classified as immediate acute, late acute and chronic. The immediate acute effect shows an increase in heart rate, pulmonary ventilation and sweating; the late acute ones occur up to 72 hours after exercise, where a slight reduction in blood pressure levels, especially in hypertensive patients, and an improvement in endothelial function are identified (Negrão, 2006; Ghorayeb, 1999; Ferreira Filho, 2007; Micheli, 2012). Chronic effects are seen in individuals with frequent exposure to exercise and in better physical condition, presenting bradycardia at rest, muscle hypertrophy, physiological hypertrophy of the left ventricle and an increased maximum consumption of oxygen. It should also be noted that other factors influence the way in which each organism responds to physical exercise. Regarding gender, pronounced differences were not found even though women, when compared with men, are privileged to postpone the onset of a hypertensive condition (Sociedade Brasileira de Hipertensão, 2016).

Most studies, including meta-analyzes, demonstrate a greater magnitude in the reduction of systolic blood pressure levels after aerobic activity in individuals aged between 41 and 60; as for ethnicity, the drop in blood pressure is more evident in Asians than in Caucasians . The Brazilian population seems to be responsive to physical exercise to reduce blood pressure levels (Ghorayeb, 1999). Studies carried out in Africans by Kokkinos et al. (2001) observed the effects of physical training on hypertensive individuals who, after a 32-week training, decreased the dose of antihypertensive drugs, which is already a benefit for the African population (Negrão, 2006). The genetic influence must be considered as we find decreased blood pressure levels (both systolic and diastolic); however, the difference is made in the magnitude of this reduction, which proves that the individual's genotype influences the response to exercise to control hypertension (Negrão, 2006). A battle has been fought to make the population aware that hypertensive patients and normotensive individuals should exercise, which really poses a constant struggle on the part of public health. It is not as simple as just making areas available for physical activity. Hypertensive patients must first undergo a previous clinical evaluation and develop dynamic aerobic activities such as walking, jogging, cycling and swimming, but there is a need to prescribe exercise with frequency and intensity according to the patient's hypertensive level (Sociedade Brasileira de Hipertensão, 2016). In cases where the patient presents moderate to severe hypertension, monitoring with follow-up is necessary so that

the activity can be carried out with the lowest risk. The recommended frequency is three to five times a week and intensity between 60% to 80% of the maximum heart rate, known by at least one exercise test or between 50% and 70% of peak oxygen consumption, measured by the ergo spirometry test or cardiopulmonary test (Micheli, 2012). These exercise sessions must last between 30 and 60 minutes and include resistance exercises with load, not exceeding 50% of the maximum voluntary contraction, known by the test of one repetition maximum (1RM), in a complementary way to aerobic exercises (Micheli, 2012). The priority of supervising physical exercise sessions is clear, as it implies physiological knowledge related to the exercise, for an adequate prescription and monitoring of physical activity to patients known to be hypertensive, the undiagnosed hypertensives, and those with hypertension complications.

Physical Exercises And Cost Control Ofthe Hypertensives: Rich or developing countries seek the control and prevention of hypertension because, behind this condition, there are other related diseases such as diabetes, obesity, heart failure, stroke, acute myocardial infarction, not to mention other psychological or emotional ones, like low self-esteem, progressing to depression.[10,15] As is evident, a sole condition is overwhelming in the resources of public health, in our country funded by a model called Unified Health System (SUS), whose principles are universality, equity and integrality, providing our population with total coverage for any pathology (Vieira, 2006). As if the condition of the disease and the finite resources were not enough, there is another factor that makes it even more difficult for the SUS to maintain coverage for its users; this factor is the technological advance in a rampant way and its quick dissemination throughout the world in minutes (Pitanga, 2004; Vieira, 2006). In Brazil, cardiovascular diseases represent a high frequency of hospitalizations, with a high socioeconomic cost. Data from the Hospital Information System of the SUS point out a significant decrease in hospital stays: from 98.1/100,000 inhabitants in 2000 to 44.2/100,000 inhabitants in 2013 (Sociedade Brasileira de Hipertensão, 2016).

As the adherence to pharmacological treatment and changes in lifestyle are influenced by variables such as gender, age, and socio-cultural condition, this is a major challenge for medical assistants and strategists who manage public health in our country (Oshiro, 2007). Our Ministry of Health has created several projects focusing on hypertensive disease; this only happened because the financial issue also becomes relevant: there is a need for efficiency in the provision of procedures in public health as resources are scarce (Pitanga, 2004; Vieira, 2009). A study carried out in Pelotas showed that 38% of the costs for the treatment of chronic degenerative diseases such as hypertension and diabetes are spent on medications even though they are aware of the patient's difficult adherence to treatment (Marinho, 2011). The ideal management model is the one that efficiently encourages patients to adhere to therapy and adapt to behavioral changes, so that they can live without complications resulting from the disease, as they understand that in fact the condition is a symptom with wide manifestation of one or more underlying causal mechanisms. It would therefore be a "facilitating" network management (Christensen, 2009). The greatest problem is the constant attempt to curb general expenses in the quality medical assistance that makes this assistance more inaccessible, even for those who can afford it.

While Brazil increased its health costs by 9.6% in total between 2002 and 2006, an increase of 123.6% was seen in medicines in the same period and the global trend is to increase these expenses. "The costs of the system are supplied by a controlled reactor called payment for services rendered, as Jean Baptiste Say said: when the assistants earn more money for assisting more, the offer creates its own demand". When a management model is implemented that decides to invest in the health care user instead of spending on the disease, the result will be cost reduction; this is what happens when we use physical activity to prevent and treat hypertension (Milstein-Moscati, 2000; Pitanga, 2004).

The savings on physical activity would be much higher compared to hospitalization expenses. The amount of R$ 4,250,000.00 is spent annually on hospitalizations generated from cardiovascular diseases; about R$ 2,100,000.00 could be saved if the sedentary population turned out to be physically active. The incorporation of daily physical activity could also reduce the expenses of medication to treat hypertension up to R$ 13,000.00. Between 2004 and 2009, the budget for the Ministry of Health went from R$ 29.2 to R$ 48.3 billion and the budget proposal for 2010 represents an expense of R$ 54.6 billion. Despite the evident increase in expenditure, the targeting for primary health care is included here, by increasing the prevention programs.

It will be straightforward necessary to intensify investments in public health, but in a conscious way and always with the aim of using tools to control these funds, since an increase of individuals affected with hypertension is expected. Physical exercise is in line with this proposal of cost reduction, primarily because by practicing it, not only hypertensive disease could be controlled, but we would also address other chronic degenerative diseases such as obesity, dyslipidemia, myocardial infarction, stroke, diabetes and depression. A study carried out in Recife in the reference unit of medium and high complexity identified that 36.3% of the expenses refer to the purchase of medicines, 20.5% are paid for services from third parties and 20.1% are spent with staff. In the Brazilian SUS, the costs related to drugs for the treatment of arterial hypertension reach 52.3%. Physical exercise in systemic arterial hypertension has the basic objective of decreasing cardiovascular morbimortality, as it favors the reduction of blood pressure. This measure, indicated for all hypertensive patients, is also recommended by the VI Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure. These recommendations imply reduced costs and risks, besides enhancing the effectiveness of drug treatment (Dib, 2010). It is recommended that exercises to control and prevent arterial hypertension should preferably be performed every day, with moderate intensity, based on the heart rate or oxygen consumption, thirty minutes continuously, especially aerobic and complemented with resistance exercises.

Through physiological adaptations according to physical conditioning, the exercises begin to reduce blood pressure at rest initially, evolving to reducing the need for medication doses in those who are already hypertensive drug users and preventing hypertension in normotensive individuals (Negrão, 2006). The reduction in blood pressure levels reaches approximately 5 - 7 mmhg after an acute isolated exercise session or after chronic training, which directly influences costs, since with a reduction of only two millimeters of mercury, the stroke risk is decreased from 14% to 17%, and the coronary heart disease, from 6% to 9%, according to the American College of Sports Medicine (ACSM, 2004 apud Negrão et al., 2006).
In the exercise physiology book, Ghorayebet al. (1999) mentions the risk of prescribing exercise to hypertensive individuals or to those who have any other associated complication. Sedentary lifestyle is seen in 60% to 70% of most countries and this condition triggers chronic degenerative diseases and consequential economic loss (Micheli, 2012). The increase in energy demand through physical activities produces cardiovascular, respiratory, and metabolic effects, called acute responses to exercises, and that if they are kept on a regular basis, morphofunctional changes called chronic effects occur (Ghorayeb, 1999). Both dynamic and static exercise promote healthy adaptations in the cardiovascular system such as increased cardiac output, further oxidative potential of the skeletal muscles involved, bradycardia and higher stroke volume. In static exercise these changes are less marked (Ghorayeb, 1999).

Knowing that there are acute and chronic changes when physical exercise is established, personalized pre-assessment is of utmost importance for those who will undergo exercise sessions, especially in individuals over the age of 35 in whom the first sign of ischemic heart disease may be sudden death (Milstein-Moscati, 2000). The great challenge for sport physicians and physical educators is when the results of pre-participation tests show that the physiological changes are very close to the risk threshold that the exercises imply,

which can result in harmful complications without a due monitoring in an appropriate location (Pitanga, 2004). During the stress testing or cardiopulmonary test, the exact moment is sought when changes in the electrocardiogram or blood pressure would occur, thus guiding the most accurate and safest prescription for the hypertensive patient (Negrão, 2006). There are several ways to prescribe exercises aimed at individuals with some disease, but the most accurate one would be to obtain the maximum heart rate and aerobic and anaerobic compensation points by means of ergometric stress or cardiopulmonary tests. The standardized programs present stronger bias in the prescription related to heart rate, but they can have their value in patients up to the age of 25 and without associated morbidity (Negrão, 2006). It is generally preferable to use a percentage of heart rate reserve as a safety parameter between 60% and 70%. Let us take an individual who has identified his maximum heart rate of 200 beats per minute (bpm) and a rest rate of 80 bpm, so the difference between the maximum and the rest is 120 bpm. This will be multiplied by the reserve percentage, thus yielding the minimum and maximum training zone (Ghorayeb, 1999). When we deal with a moderate to severe hypertensive patient, the prescription should start with a reserve percentage between 50% and 60% and the blood pressure would always be watched below 160/105 mmHg (Negrão, 2006; Ghorayeb, 1999). The measurement of blood pressure should be checked before the beginning and at the end of the exercise sessions, to make a follow-up and a possible medical indication for changing medications or reducing doses, in addition to providing safety during training. Obviously with the recommendation of physical activity accompanied by a healthy diet, the cessation of smoking and a decreased salt intake, Kaplanet al.[21] showed reduced levels of systolic and diastolic blood pressure of 5 and 3 mmHg, respectively, and a reduced body weight of 1 kg (Negrão, 2006). After a short training period comprising three times a week, not less than thirty minutes each session and around 12 to 14 weeks, adaptations were found such as increased HDL-cholesterol, fibrinolytic activity, reduced heart rate, reduced resting blood pressure, decreased arrhythmias triggered by adrenergic stimulation, increased glucose tolerance and sensitivity of insulin receptors (Ghorayeb, 1999).

FINAL CONSIDERATIONS

The search for resource management in public health is a challenge for several countries and a constant struggle faced by government authorities. Also evident is the lack of resources, which can even limit the user's access to health services. Although it is not completely clear how the exercise works to reduce blood pressure levels, national and international societies and medical associations recommend changing eating and living habits, and encourage physical activity. Unrestrained spending on public health, that often occurs in disarray without efficient and effective management, points toward a need to control and plan long-term actions for the population so that the revenue from public funds with chronic diseases may be reduced. Reaching the objective that was to show the cost that hypertension brings to the health sectors and how much savings can be made when a simple action is implemented, that is, the stimulation of physical activity, we did come across a solution, but that must be monitored by a multidisciplinary team (physicians, physical education professionals, nurses and health agents). According to studies carried out by the Ministry of Health, it was shown that 52.3% of the budget are dispensed in the purchase of drugs to manage hypertension, which means a high cost that could be reduced, as well as the morbidity and mortality rates, if physical activities were introduced (Chung *et al.,* 2020). It is also a consensus in the prescription of physical exercises that the individualization is what generates safety in the implementation of it and achieves the patient's goals, with greater ease. However, what really matters is the safety in the accomplishment of the physical activity in hypertensive patients. It is worth mentioning that in Brazil there are already programs that encourage physical activity in a comprehensive and collective way, but our proposal aims to create specific teams to monitor and prescribe exercises for patients enrolled in hypertension programs in health units, because it is there that the patient seeks appointment, medication and guidance.

The physical education professional is an adjunct in the management of health resources, but he does not have his proper space and his value recognized yet, perhaps because the municipal and state governments have not appropriately identified the direct and indirect costs that arterial hypertension stands for in the health system. We believe that by raising the issue, we will draw the attention of our managers and contribute to the management of chronic diseases, including hypertensive disease. It is also clear that the creation of outdoor gyms is an excellent initiative to reduce sedentary lifestyle and consequently the related diseases, but with regard to the use of physical exercise as a treatment for diseases, this must be individualized as safety and closer monitoring are of paramount importance.

This has not excluded the possibility of creating a low risk group and monitoring it by a single professional, however those who are at higher risk in the previous evaluation should be treated at specific times with personalized attention. The adaptations of lipid-hematological, cardiovascular and metabolic profiles to bone density and the immunological and psychological systems show that the exercises not only have control on blood pressure, but also act directly on other diseases that also cause loss to government coffers. As a conclusion, we can say that physical exercise should be indicated not only as a prevention of chronic degenerative diseases, but also in the treatment of arterial hypertension, with evidence of reduced use of drugs and doses, decreasing the rate of complications and consequential reduction of expenditure in the public health sector.

REFERENCES

Brasil [Ministério da Saúde] Departamento de Informática do SUS. Sistema de Informações Ambulatoriais. [internet]. 2009 [cited 2019 Aug 11]. Available from: http://siasih.datasus.gov.br/arqTabulacao.cfm

Castro Júnior EF, Barreto LA, Oliveira JAA, Almeida PC, Leite JAD. 2020. Avaliação do nível de atividade física e fatores associados em estudantes de medicina de Fortaleza-CE. Rev Bras Ciênc Esporte. [Internet]. 2012 Dec [cited Jun 15];34(4):955-67. Available from: http://www.scielo.br/scielo.php? script=sci_arttext& pid=S0101- 32892012000400011&lng=en. https://doi.org/ 10.1590/ S0101-32892012000400011

Christensen CM, Grossman JH, Hwang J. 2009. Inovação na gestão da saúde: a receita para reduzir custos e aumentar qualidade. Porto Alegre: Bookman.

Chung SC, Providencia R, Sofat R. 2020. Association between Angiotensin Blockade, and Incidence of Influenza in the United Kingdom. *N Engl J Med.,* 383(4):397-400. Available from: doi:10.1056/NEJMc2005396

Costa JSD, Fuchs SC, Olinto MTA, Gigante DP, Menezes AMB, Macedo S et al. 2020. Cost-effectiveness of hypertension treatment: a population-based study. Sao Paulo Med. J. [Internet]. 2002 July [cited Aug 07];120(4):100-4. Available from: http://www.scielo.br/scielo. php?script=sci_ arttext& pid=S1516-31802002000400002&lng=en. http://dx.doi.org/10.1590/S1516-31802002000400002

Dib MW, Riera R, Ferraz MB. 2010. Estimated annual cost of arterial hypertension treatment in Brazil. Ver Panam Salud Publica. 27(2):125–31.

Ferreira Filho C, Meneghini A, Riera ARP, Serpa Neto AS, Teixeira GK, Ferreira C. 2007. Benefícios do exercício físico na hipertensão arterial sistêmica. Arq Méd ABC. Jul-Dez;32(2):82-7.

Ghorayeb N, Barros Neto TL. 1999. O exercício: preparação fisiológica, avaliação médica, aspectos especiais e preventivos. São Paulo: Atheneu.

Kaplan NM, Victor RG. 2014. Clinical Hypertension. 11th ed. Philadelphia: Williams & Wilkins.

Kokkinos PF, Narayan P, Papademetriou V. Exercise as a hypertension therapy. Cardiol Clin. 2001;19:507-16. Available from: doi: 10.1016/s0733-8651(05)70232-0.

Marinho MGS, Cesse Eduarda AP, Bezerra AFB, Sousa IMC, Fontbonne A, Carvalho EF. 2011. Análise de custos da assistência à saúde aos portadores de diabetes melito e hipertensão arterial em uma unidade de saúde pública de referência em Recife - Brasil. Arq Bras Endocrinol Metab. [Internet]. Aug [cited 25 May 2020];55(6): 406-11. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0004-27302011000600007&lng=en. https://doi.org/10.1590/S0004-27302011000600007

Micheli LJ, Pigozzi F, Chan KM, Frontera W, Bachl N, Smith AD, Alenabi ST. 2012. Editors of Team Physician Manual, International Federation of Sports Medicine (FIMS) 3rd ed. Routledge, London and New York; 2012.

Milstein-Moscati I, Persano S, Castro L. 2000. Aspectos metodológicos e comportamentais da adesão à terapêutica. In: Castro LLC (Org.). Fundamentos de farmacoepidemiologia. São Paulo: AG. p. 170-80.

Negrão CE, Barretto, ACP. 2006. Cardiologia do Exercício: Do Atleta ao Cardiopata. 2ª ed. São Paulo: Manole.

Oshiro ML. 2007. Fatores para não-adesão ao programa de controle da hipertensão arterial em Campo Grande, MS: um estudo de caso e controle 2007. Tese [Doutorado]. Brasília: Universidade de Brasília (UNB).

Pitanga, F.J. G. 2004. Epidemiologia da atividade física, exercício físico e saúde. 2ª ed. Editora Phorte.

Sabate E. 2020. Adherence to long-term therapies: Evidence for action. [internet] Geneva, Switzerland: World Health Organization (WHO); 2003. [cited Jan 14]. Available from: http://www.who.int/chp/knowledge/publications/adherence_report/en/

Santos ZMSA, Frota MA, Cruz DM, Holanda SDO. 2019. Adesão do cliente hipertenso ao tratamento: análise com abordagem interdisciplinar. Texto contexto - enferm. [Internet]. 2005 [cited Aug 11]; 14(3):332-40. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-07072005000300003&lng=en. http://dx.doi.org/10.1590/S0104-07072005000300003

Sociedade Brasileira de Hipertensão (SBH). 7ª Diretrizes Brasileiras de Hipertensão. [internet]. 2016. [cited 2020 Mar 11]. Available from: http://www.sbh.org.br/documentos

Teixeira JAC. 2000. Hipertensão arterial sistêmica e atividade física. Rev Socerj 13:25-30.

Vieira FS. Gasto do Ministério da Saúde com medicamentos: tendência dos programas de 2002 a 2007. Rev Saúde Pública. 2009;43(4):674-81.

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