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## ORIGINAL

### ALIMENTARY CONSUMPTION OF ACTIVE AND PHYSICALLY INACTIVE WOMEN IN POSTMENOPAUSAL PERIOD

### CONSUMO ALIMENTICIO DE MUJERES ACTIVAS E INACTIVAS FÍSICAMENTE DURANTE LA POST-MENOPAUSIA

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## ABSTRACT

The aim of this study was to observe the dietary intake and the prevalence of metabolic syndrome in physically active and inactive women in the post-menopause. The sample was composed of 83 women, from the municipality of Natal (Rio Grande do Norte) in Brazil; from the "Natal Active" program, with an average age of  $59.7 \pm 8.08$  years old. A questionnaire to analyze the frequency of food consumption, physical activity questionnaire, a clinical anamnesis, anthropometric evaluation, biochemical tests and a diagnosis of metabolic syndrome was applied. The results showed that active women consume more protective foods than inactive women. The prevalence of metabolic syndrome in inactive women was higher than in active women, in addition, there is a need to change those habits in this population, being able thus to achieve greater physical and metabolic changes, minimizing the incidence of metabolic syndrome in both groups.

**KEYWORDS:** Post-menopause, metabolic syndrome, Diet and Physical Activity

## RESUMEN

El objetivo del presente estudio fue observar el consumo alimenticio y la prevalencia del síndrome metabólico en mujeres activas e inactivas físicamente en la post-menopausia. La muestra fue compuesta de 83 mujeres, pertenecientes al municipio de Natal (Río Grande do Norte) de Brasil; pertenecientes al programa "Natal Activa", con edad media de  $59,7 \pm 8,08$  años. Se aplicó un cuestionario para analizar la frecuencia del consumo alimenticio, un cuestionario de actividad física, una anamnesis clínica, una evaluación antropométrica, exámenes bioquímicos y un diagnóstico del Síndrome Metabólico. Los resultados mostraron que las mujeres activas consumen más alimentos protectores que las mujeres inactivas. La prevalencia del síndrome metabólico en las mujeres inactivas fue mayor que en las mujeres activas, además, existe la necesidad de cambiar dichos hábitos en esta población, pudiéndose alcanzar así mayores cambios corporales y metabólicos, minimizando la incidencia del síndrome metabólico en los dos grupos.

**PALABRAS CLAVE:** post-menopausia, síndrome metabólico, dieta y actividad física.

## INTRODUCTION

Metabolic syndrome (MS) is a complex disorder, arising from the related incidence of three or more metabolic abnormalities, highlighting the amount of abdominal fat, hypertension, hyperglycemia and dyslipidemia; thus becoming one of the main public health challenges in the world (Manheimer, van Zuuren, Fedorowicz, & Pijl, 2015; Pang et al., 2010). These multiple phenotypes are related to morphological characteristics, such as body mass index (BMI), insulin resistance (conferring a greater risk for the development of type 2 diabetes) and abdominal obesity; In addition to alterations in biochemical variables, elevated

fasting glucose, reduced HDL and triglycerides above normal (Pang et al., 2010).

Sedentary lifestyle and genetic predisposition, coupled with an inadequate diet, form a combination that can be harmful to the onset of metabolic disorders, directly associated with an increase in mortality, such as endometrial cancer, diabetes and cardiovascular disease (Huang & Liu, 2014; Zhang et al., 2009). Foods considered to be a risk for cardiovascular diseases, such as saturated fats, cholesterol, trans fatty acids, sodium and refined carbohydrates. In contrast, sources of dietary fiber, vitamins, minerals, unsaturated fatty acids (polyunsaturated and monounsaturated), phytochemicals or antioxidants are given the status of protective foods (Godoy-Matos et al., 2009; Neumann, Shirassu, & Fisberg, 2006).

An increased risk of MS and cardiovascular diseases in postmenopausal women was demonstrated, varying from 33% to 42%, in addition to a greater influence of menopause on the presence of MS (Jouyandeh, Nayebzadeh, Qorbani, & Asadi, 2013; Mendes, Theodoro, Rodrigues, & Olinto, 2012).

During menopause (a period started one year after the permanent interruption of menstrual cycles), the result of loss of follicular activity in the ovaries results in the appearance of hormonal alterations that can trigger the onset of cardiovascular diseases (CVD) and osteoporosis and the accelerated loss of bone mass (Santos, Marcellini, De Melo, & Almeida, 2008). Post-menopause is a period of relative hyperandrogenism, producing a decrease of estrogen, compared to androgen, which can lead to the formation of atherosclerosis, with an increase in LDL cholesterol levels and a decrease in HDL (Mendes et al., 2012). Following Janssen et al. (2010), post-menopausal women have a higher accumulation of visceral fat compared to those who still menstruate, regardlessly of the aging process.

Regular physical activity and physical exercise are measures (therapeutic and prophylactic) in preventing and combating risk factors that are directly related to MS (Yu et al., 2009). The American College of Sports Medicine (2011) argues that adequate levels of physical activity practice are sufficient to decrease and delay mortality from MS-related causes. Also, scheduled physical exercise along with usual treatment leads to an increase in bone mineral density in postmenopausal women (Molina, Ducaud, Bustamante, León-Prados, & Otero-Saborido, 2015). In the same context, adults who seek chronic disease prevention are oriented to focus on the daily practice of physical exercise (cardio-respiratory) for 30 minutes or more with moderate intensity and about 5 times a week, totaling about 150 minutes of exercise per week; Or being 20 minutes daily of vigorous intensity for 3 days per week. The inversely proportional relationship between physical activity and metabolic risks may be associated with increased energy expenditure and immune responses, such as reduced fat mass and blood pressure (Huang & Liu, 2014).

Considering the evidence cited, the present study aims to observe the dietary intake and the prevalence of MS in active and physically inactive women in the postmenopause.

## MATERIAL AND METHODS

### *Characteristics of the sample*

The sample is composed by 83 women ( $n = 59.7 \pm 8.08$ ), from the Natal Activa program of the city of Natal, Rio Grande do Norte (Brazil). The inclusion criteria was to be in the post-menopausal stage. Women who had some kind of impediment to carrying out the proposed evaluations and those who gave up the study by self-expression were excluded from the research.

### *Ethical aspects*

All the women were informed of the procedures to be carried out, the possible benefits and the implicit risks involved in carrying out the research. For voluntary participation, a free informed consent and participation (TCLE) was signed. The research protocol was based on the guidelines proposed in Resolution 196/96 of the National Health Council on research on human beings and approved by the Ethical Committee on Research of the University Hospital Onofre Lopes (CEP / HUOL), on the Protocol CEP / HUOL: 540/11, in accordance with Resolution CNS196 / 96, in accordance with the Declaration of Helsinki 1975, Appendix 2000.

### *Evaluation of food consumption*

The Food Frequency Questionnaire (QFCA) is a method that evaluates dietary intake and may be related to chronic noncommunicable conditions (Fisberg, Marchioni, & Colucci, 2009). The QFCA is validated and adapted by Ribeiro et al.(2006), applying to all women who participated in the research. The Daily Food Consumption Profile was divided into two groups: protective foods for cardiovascular diseases and foods considered to be at risk for such ailments, once food consumption was considered (1), twice (2) or more times per day, And analyzed in relation to the level of physical activity of women (inactive or active).

### *Assessment of the level of physical activity*

An International Physical Activity Questionnaire (IPAQ) was used (Matsudo et al., 2001), which identifies the levels of physical activity performed by each participant (NAF). Likewise, the participants of the research were divided into two groups: active and inactive. Those women who practiced physical activity daily or at least 3-5 times per week were considered active; and inactive, those who practiced physical activity less than 3 times or simply did not practice (Matsudo et al., 2001).

### *Determination of body composition*

All measures were obtained by previously trained evaluators, whose Technical Measurement Error (SEM) was 0.1% for perimetric measurements (Perini,

Oliveira, Ornellas, & Oliveira, 2005), each group of sample measurements being observed and evaluated by A single evaluator, thus minimizing the error in the measurement.

Body mass and height were used as factors for determining the Body Mass Index (BMI) of the women evaluated. The criteria established by the World Health Organization (WHO) (2002), which considered the BMI from 18.5 to 24.9 kg / m<sup>2</sup> as normal, from 25 to 29.9 kg / m<sup>2</sup> as overweight and greater than 30 Kg / m<sup>2</sup> as obesity for adult women; Following the guidelines of Lipschitz (1994), considers a BMI of 22 to 27 kg / m<sup>2</sup> as normal and > 27 kg / m<sup>2</sup> as being overweight for the elderly. All female participants were measured with the minimum of dress and barefoot for body mass and height, as recommended by the National Heart & Insitute (2000). Perimeter waist values (PC) have followed the recommendations of ISAK (Marfell-Jones, Olds, Stewart, & Carter, 2006).

#### *Measurement of blood pressure*

Blood pressure was measured through the OMRON HEF 780 digitally. The women evaluated were in rest for five minutes in a quiet environment, without practicing physical exercise for 60 to 90 minutes before the measurement, nor any alcohol, coffee, tobacco and food 24 hours before the measurement. During the measurement all kept their legs without crossing, feet resting on the floor, with the back resting completely on the chair and relaxed. Any clothing that obstructed the measurement on the arm was removed, the arm being placed at a height of the heart (mid-point of the sternum or intercostal space), supported and with the palm of the hand turned upwards and with the elbow in semi-flexion. The evaluators remained silent during the verification, which was performed three times.

#### *Determination of biochemical parameters*

The women in the study underwent a venous puncture in the fasting period of 12 to 14 hours. Peripheral blood samples were collected without anticoagulant (10mL) to obtain the serum that was used for glycolysis dosing and lipid profile analysis. Determinations of serum glycolysis, total cholesterol, HDL cholesterol, and triglycerides were performed by enzymatic-colorimetric assays. All of them used the Labtest Diagnostics kits with the RA-50 equipment (Bayer Diagnostics Chemistry System, Dublin, Ireland).

#### *Diagnosis of metabolic syndrome*

The SM was diagnosed using criteria of NCEP-ATP III (2001), based on the result of at least three factors described below: abdominal obesity by means of abdominal circumference > 88 cm, Triglycerides  $\geq$  150 mg / dL, HDL Cholesterol < 50 mg / dL, Blood pressure  $\geq$  130 mmHg or  $\geq$ 85 mmHg and fasting glucose  $\geq$  110 mg / dL (or diagnosed with Diabetes mellitus). The prevalence of the metabolic syndrome was calculated according to the NCEP-ATP III criteria, relating it to the level of physical activity (NAF), with the metabolic syndrome

being the dependent variable and physical activity being the independent variable.

### *Statistic analysis*

For the descriptive analysis the distribution of the data was observed through the Shapiro-Wilk test, and it was concluded that the data obey a normal distribution in a Gaussian curve. That is why we used the mean and standard deviation variables. Through the Levene test we observed homogeneities of the variances, being in this case different in the two groups. The test did not present significant statistical differences for a 95% confidence interval, the p-value of the test was higher than the chosen significance level of 5%, therefore, we did not reject the hypothesis of equality in the variances.

For the inferences, the prevalence ratio calculated for the sample, divided by the level of physical activity (active women or inactive women) was used and the Chi square test was calculated. The daily dietary intake profile for both groups was presented by the frequency of food consumption in percentages (%).

## RESULTS

In Table 1, the active women show a lower age and body mass when compared to the inactive women. There was no difference in height and Body Mass Index (BMI), so it was classified as overweight for all women.

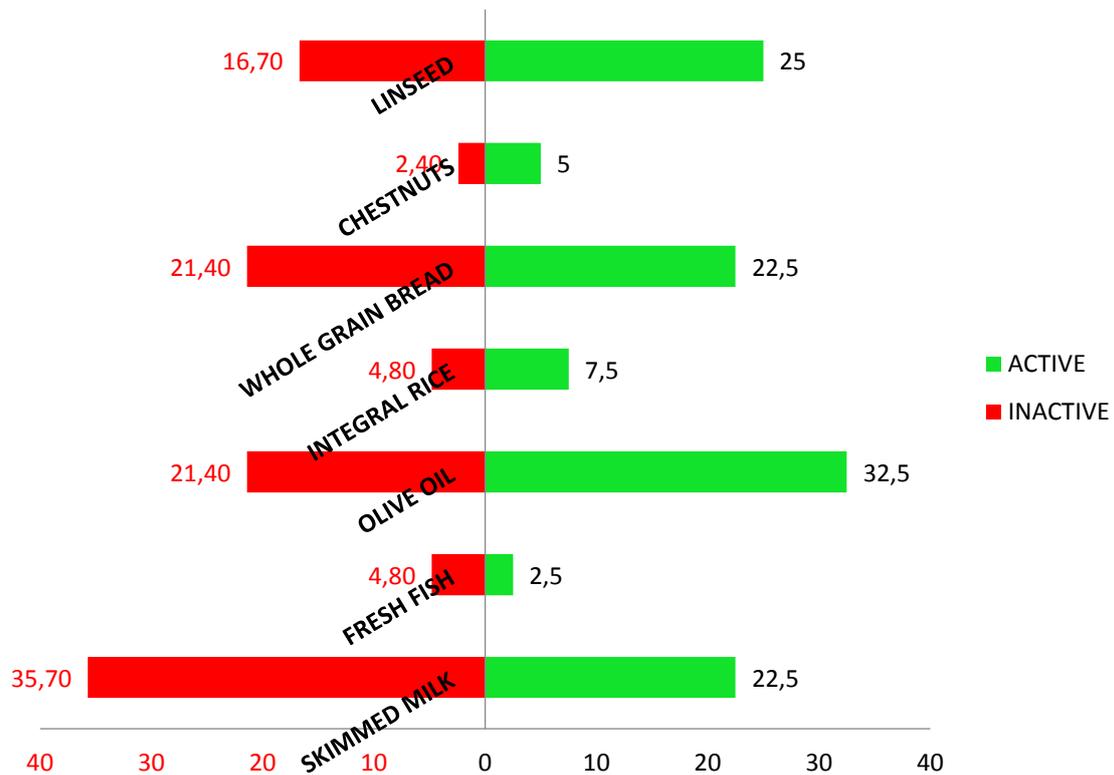
**Table 1.** Descriptive data of the sample and the variables for the diagnosis of the Metabolic Syndrome in postmenopausal women according to the level of physical activity.

Variables	Level of Physical Activity		p-valor
	Inactive (n=42) Average (DP)	Active (n=41) Average (DP)	
<b>Age (years)</b>	60,7 (8,07)	58,6 (8,76)	0,05*
<b>Body mass (Kg)</b>	70,8 (9,51)	67,0 (8,12)	0,83
<b>Height (m)</b>	1,54 (0,05)	1,54 (0,05)	0,35
<b>Body mass Index (Kg/m2)</b>	29,6 (4,23)	27,9 (2,99)	0,96
<b>Waist Circumference (cm)</b>	91,8 (9,19)	88,3 (7,76)	0,61
<b>Systolic blood pressure (mmHg)</b>	136,9 (29,66)	139,3 (22,26)	0,80
<b>Diastolic Blood Pressure (mmHg)</b>	81,9 (10,62)	86,2 (9,98)	0,28
<b>Glucose (mg/dl)</b>	83,7 (23,52)	93,7 (47,23)	0,39
<b>HDL (mg/dl)</b>	44,9 (13,47)	42,8 (9,61)	0,57
<b>Triglycerides (mg/dl)</b>	109,9 (59,83)	107,5 (75,8)	0,91

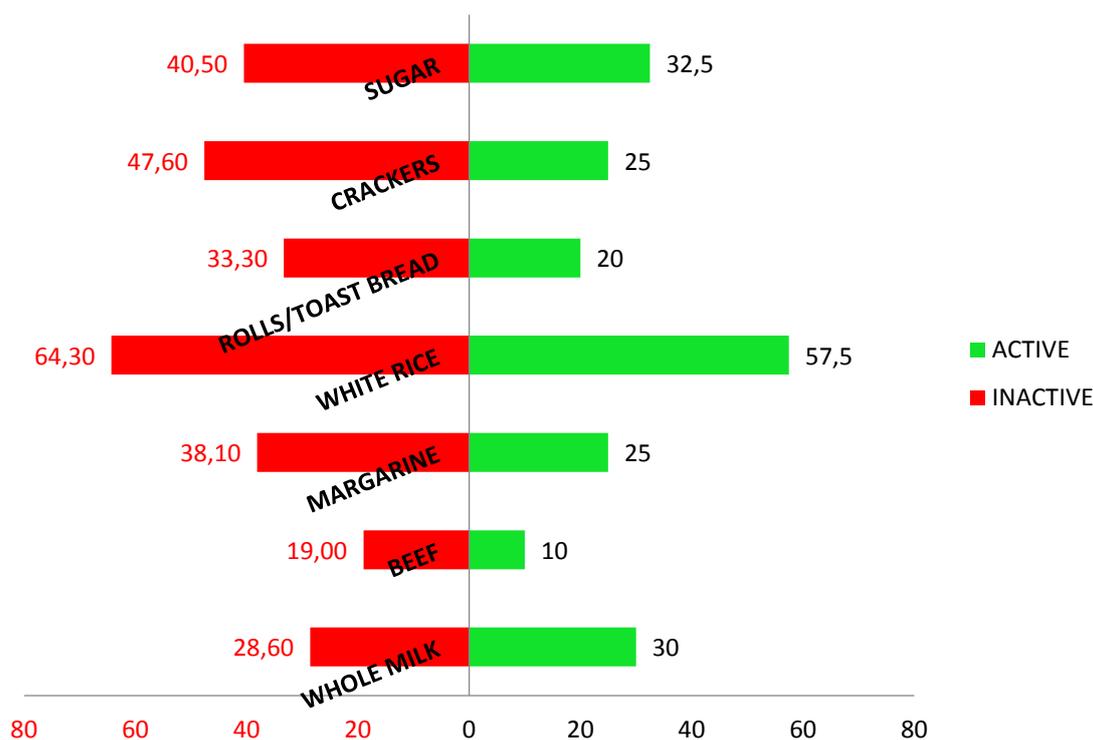
Based on the Food Consumption Frequency Questionnaire (QFCA), Figure 1 represents the consumption profile based on protective foods for cardiovascular diseases; Figure 2 represents the opposite, foods considered a risk for cardiovascular diseases.

Active women consume more protective foods compared to inactive women, with the exception of skim milk and fish, whose prevalence of consumption is higher in inactive women. However, in both groups it was found that fish consumption was reduced.

Foods considered at risk are more consumed by the group of inactive women, with the exception of whole milk, whose highest consumption was attributed to active women.



**Image 1.** Profile of daily dietary intake of active and inactive women, according to the consumption of protective foods for cardiovascular diseases (%).



**Figure 2.** Daily food consumption profile of active and inactive women, according to the consumption of foods considered to be at risk for cardiovascular diseases (%).

Table 2 shows how the prevalence of MS in inactive women was higher than in active women. The Prevalence Ratio (PR) = 1.24 (greater than 1) reveals an association between MS and NAF in postmenopausal women.

**Table 2.** Prevalence of Metabolic Syndrome and its association with NAF in postmenopausal women.

	Metabolic Syndrome		$\chi^2$ (p-valor)
	YES	NO	
ACTIVE	53,30%	44,00%	0,59
INACTIVE	46,70%	56,00%	(0,52)

## DISCUSSION

The results observed in the present study reveal that active women consume more protective foods (flax, chestnuts, brown bread, brown rice and oil) than inactive ones, with exceptions for skim milk and fish. These data, coupled with the benefits of physical exercise, seem to lead to greater awareness and concern with the adoption and maintenance of healthy living habits, thus corroborating with the conclusions given by Huang and Liu (2014), who emphasized that individuals with a high level of physical activity generally maintain a healthy lifestyle. For these, the intake of dietary fibers, vitamins and other nutrients, contribute to maintaining the metabolic functions and increase the preventive effect against the metabolic syndrome.

The data obtained in this study revealed that inactive women showed a higher age and body mass value compared to active ones, as well as a greater accumulation of body fat observed through BMI and waist circumference. Observing the mean age of inactive women, it can be confirmed that the greater the aging, the greater the probability of physical inactivity. In addition, the increase in age would be related to the reduction of basal metabolism, altered body composition and an inadequate lifestyle (Jouyandeh et al., 2013; Mendes et al., 2012), which may justify the behavior in the data from inactive women in the present study.

However, although the group of active women had a lower BMI, both groups were found to be overweight. This behavior is probably due to the fact that the post-menopausal woman has a higher accumulation of visceral fat, due to the reduction of the estrogen hormone, thus generating a greater susceptibility to fat increase in the abdominal area (Mendes et al., 2012). It is possible that such behavior also occurs due to the positive energy balance, i.e., caloric intake above daily caloric needs and by the low caloric expenditure in relation to a low or inadequate practice of physical activity, either by practice of low intensity and/or volume below their ideal body weight control, according to the age and sex of the patients (Garber et al., 2011).

The waist circumference is not a clear marker of abdominal adiposity, since it is also influenced by the total adiposity of the patient. Therefore, generally, the higher the BMI, the greater the waist circumference, as well as the excess of visceral fat, which is characterized by a higher metabolic profile (Després et al., 2008; Jouyandeh et al., 2013; Organization, 2002), as observed in inactive women, who presented a higher prevalence of the metabolic syndrome. The example of the results obtained in the present study was also observed by Khalfa et al. (2015), where physical inactivity was linked to 88% of cases of metabolic syndrome verified, while 45% rejected a balanced diet.

Inactive women also had low intake of carbohydrates (rich in fiber), as well as a high consumption of saturated fats and sugars, characterized by low consumption of antioxidant foods, which are important for the pro-inflammatory combat generated by the Metabolic syndrome (Ribeiro Alves, Lima, & Oliveira, 2015). Confirming this feeding behavior, it was demonstrated by Steemburgo, et al. (2007) that the consumption of different types of fat is associated with the metabolic syndrome and the high consumption of whole grains is inversely associated with this prevalence, therefore, they are directly related to the reduction of the risk of mortality due to cardiovascular ailments.

Thus, in order to minimize the occurrence of the metabolic syndrome, mainly in postmenopausal women, changes in eating behavior, regular physical activity and loss of body weight are contemplated as therapies to be chosen as the first treatment which favors the reduction of waist circumference and visceral fat, improve insulin sensitivity, decrease plasma glucose and triglyceride concentrations, and increase HDL cholesterol values (Azambuja, Farinha, Rossi, Spohr, & Santos, 2015; Colpani, Oppermann, & Spritzer, 2013; Jouyandeh et al., 2013; Mendes et al., 2012).

Thus, it is important to highlight the need to propose physical and nutritional exercise intervention programs related to the prevention and control of the metabolic syndrome in postmenopausal women, with the intention of improving the dietary pattern and lifestyle of this type of population. For that, it is necessary that the nutritional project of the patient has a negative energy balance, reducing its consumption of fats, both in its saturated and hydrogenated form (trans); a greater increase in intakes of fruits, vegetables, legumen and whole grains; a reduction in the consumption of free sugar, as well as in salt (sodium) intake, in all its variants (Godoy-Matos et al., 2009). In addition, regular and adequate levels of activity practice should coexist sufficiently to improve physical fitness, with the intention of promoting health and / or body weight control (Garber et al., 2011).

## **CONCLUSION**

Postmenopausal women had a higher prevalence of daily consumption of protective foods for cardiovascular diseases, as well as the consumption of foods considered to be at risk for such diseases predominated in the inactive women group.

In addition, the prevalence of the metabolic syndrome in inactive women was higher than in active women, at the same time, there is a need to change habits in this type of population, therefore, a healthy diet with increased volume and / or intensity of Physical exercise are essential to achieve the expected body and metabolic changes, and women considered active still had a percentage of metabolic syndrome or overweight.

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