


# **Efeitos da Soja na Pressão arterial e Níveis Lipídicos em Mulheres Menopausadas Hipertensas, Pré-Hipertensas e Normotensas**

**Apresentado por Silvana de Barros  
na reunião da Unidade de Hipertensão  
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da Universidade de São Paulo  
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**EFFECT OF SOY NUT ON BLOOD  
PRESSURE AND LIPID LEVELS IN  
HYPERTENSIVE, PREHYPERTENSIVE,  
AND NORMOTENSIVE  
POSTMENOPAUSAL WOMEN**

# Effect of Soy Nuts on Blood Pressure and Lipid Levels in Hypertensive, Prehypertensive, and Normotensive Postmenopausal Women

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**Background:** Epidemiologic studies suggest a low incidence of cardiovascular disease in populations that consume dietary soy. For people aged 40 to 70 years, each increment of 20 mm Hg in systolic blood pressure (BP) or 10 mm Hg in diastolic BP doubles the risk of cardiovascular disease for BPs of 115/75 to 185/115 mm Hg.

**Methods:** To determine the effect of soy nuts on systolic and diastolic BP and lipid levels, 60 healthy postmenopausal women were randomized in a crossover design to a Therapeutic Lifestyle Changes (TLC) diet alone and a TLC diet of similar energy, fat, and protein content in which soy nuts (containing 25 g of soy protein and 101 mg of aglycone isoflavones) replaced 25 g of nonsoy protein. Each diet was followed for 8 weeks.

**Results:** Compared with the TLC diet alone, the TLC diet plus soy nuts lowered systolic and diastolic BP 9.9% and 6.8%, respectively, in hypertensive women (sys-

tolic BP  $\geq$ 140 mm Hg) and 5.2% and 2.9%, respectively, in normotensive women (systolic BP <120 mm Hg). Further subdivision of normotensive women revealed that systolic and diastolic BPs were lowered 5.5% and 2.7%, respectively, in prehypertensive women (systolic BP of 120-139 mm Hg) and 4.5% and 3.0%, respectively, in normotensive women. Soy nut supplementation lowered low-density lipoprotein cholesterol and apolipoprotein B levels 11% and 8% ( $P = .04$  for both), respectively, in hypertensive women but had no effect in normotensive women.

**Conclusions:** Substituting soy nuts for nonsoy protein in a TLC diet improves BP and low-density lipoprotein cholesterol levels in hypertensive women and BP in normotensive postmenopausal women. These findings may explain a cardioprotective effect of soy.

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# INTRODUÇÃO

- Estimativas indicam que 1 bilhão de pessoas em todo o mundo apresentam hipertensão.
- A prevalência de hipertensão aumenta com a idade. O número de mulheres hipertensas excede o número de homens.
- A estimada prevalência de hipertensão em mulheres acima de 45 anos é de 60% para brancas e 79% para negras.

# INTRODUÇÃO

- Para pessoas de 40 a 70 anos de idade, cada aumento de 20 mm Hg (PAS) e 10 mm Hg (PAD) dobra-se o risco de doença cardiovascular para pressões de 115/75 a 185/115 mm Hg.
- Estudos demonstram que a terapia anti-hipertensiva tem uma média de redução de 35% a 40% para AVC, 20% a 25% para infarto do miocárdio, e mais de 50% para insuficiência cardíaca.
- Estudos epidemiológicos sugerem uma baixa incidência de doença cardiovascular em populações que consomem dieta com soja.

# METODOLOGIA

- Critério de inclusão:

- Mulheres com ausência de fluxo menstrual por 12 meses ou períodos irregulares.

- Ondas de calor.

- Critério de exclusão:

- Fumantes atuais.

- Doença da artéria coronariana, doença da artéria periférica, doença cerebrovascular.

- DM ou nível glicêmico de 126mg/dL.

- Histórico de câncer de mama.

# METODOLOGIA

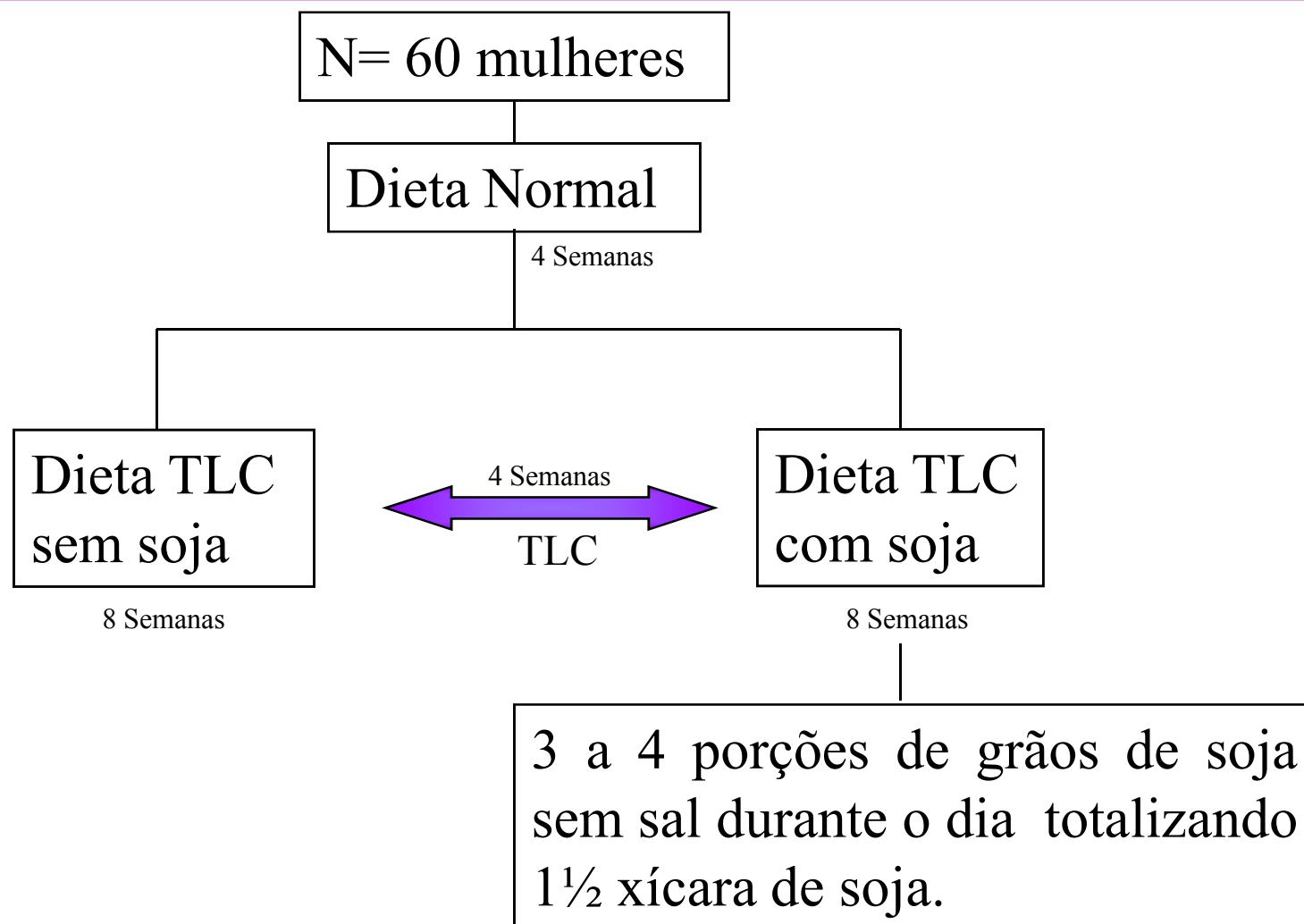
- Triglicérides  $> 400\text{mg/dL}$ .
- PAS  $\geq 165\text{mmHg}$  ou PAD  $\geq 100\text{ mmHg}$ .
- Hipotireoidismo não tratado.
- Doença sistêmica ou endócrina que afete o metabolismo lipídico, mineral ou ósseo.
- Consumo de mais de 21 drinks alcoólicos por semana.
- Uso de estatinas, terapia hormonal, medicações para osteoporose e produtos da soja foram descontinuados por 2 meses antes de entrar no estudo.

# METODOLOGIA

## Dieta TLC (Terapeutic Lifestyle Changes)

- 30% de gorduras totais ( $\leq$  7% gordura saturada, 12% gordura monoinsaturada e 11% gordura poli-insaturada).
- 15% proteína.
- 55% carboidrato.
- Menos que 200mg de colesterol por dia.
- 1200mg de cálcio.
- 2 porções de peixe por semana.
- Mulheres hipertensas foram aconselhadas a limitar a ingestão de sódio para menos que 2g por dia.

# METODOLOGIA



# METODOLOGIA

**Table 1. Nutritional Composition of One-half Cup of Soy Nuts (56 g)**

<b>Ingredient</b>	<b>Content</b>
Calories	240
Total fat, g	8
Saturated fat, g	0
<i>trans</i> fat, g	0
Polyunsaturated fat, g	6
Monounsaturated fat, g	2
Cholesterol, mg	0
Total carbohydrate, g	18
Dietary fiber, g	10
Sugars, g	6
Protein, g	24
Sodium, mg	20
Potassium, mg	780
Calcium, mg	236
Aglycone isoflavones, mg	
Genistein	61
Daidzein	30
Glycitein	10

# METODOLOGIA

**Pressão Arterial:** medida da pressão realizada no final de cada período da dieta. Sentada em uma cadeira por 5 minutos (repouso), com os pés apoiados no chão e o braço direito apoiado na altura do coração. Medida realizada com aparelho “Dinamaps” no final de cada período dietético. No início de cada visita 2 medidas da PA com intervalo de 30 segundos, se houvesse uma diferença de mais de 5mm Hg entre as duas medidas a terceira medida era realizada.

- Grupo de hipertensas: PAS  $\geq$  140mmHg ou PAD  $\geq$  90mmHg.

- Grupo de normotensas: PAS < 140mmHg ou PAD < 90mmHg.

→ Pré-hipertensas PAS 120-139 mmHg e PAD 80-89 mmHg.

→ Normotensas PAS < 120 mmHg.

**Níveis Lipídicos:** coleta de amostra de sangue (8 semanas).

**Níveis de creatinina e isoflavona:** urina de 24Hs (8 semanas).

# METODOLOGIA

**Table 2. Baseline Characteristics by Blood Pressure Status\***

<b>Characteristic</b>	<b>Normotensive Women (n = 48)</b>	<b>Hypertensive Women (n = 12)</b>	<b>P Value</b>
Age, y	53.5 ± 5.3	58.3 ± 6.5	.01
BMI	25.4 ± 4.9	28.0 ± 4.3	.008
Years since menopause	4.5 ± 4.3	7.4 ± 6.1	.01
Exercise, min/wk	156 ± 118	127 ± 120	.25
Total C, mg/dL	228 ± 39	248 ± 62	.01
LDL-C, mg/dL	143 ± 32	164 ± 57	.01
HDL-C, mg/dL	58 ± 15	56 ± 10	.70
Triglyceride, mg/dL	128 ± 97	128 ± 74	.96
Apolipoprotein B, mg/dL	111 ± 19	126 ± 37	.01
Glucose, mg/dL	98 ± 10	97 ± 11	.77

# RESULTADOS

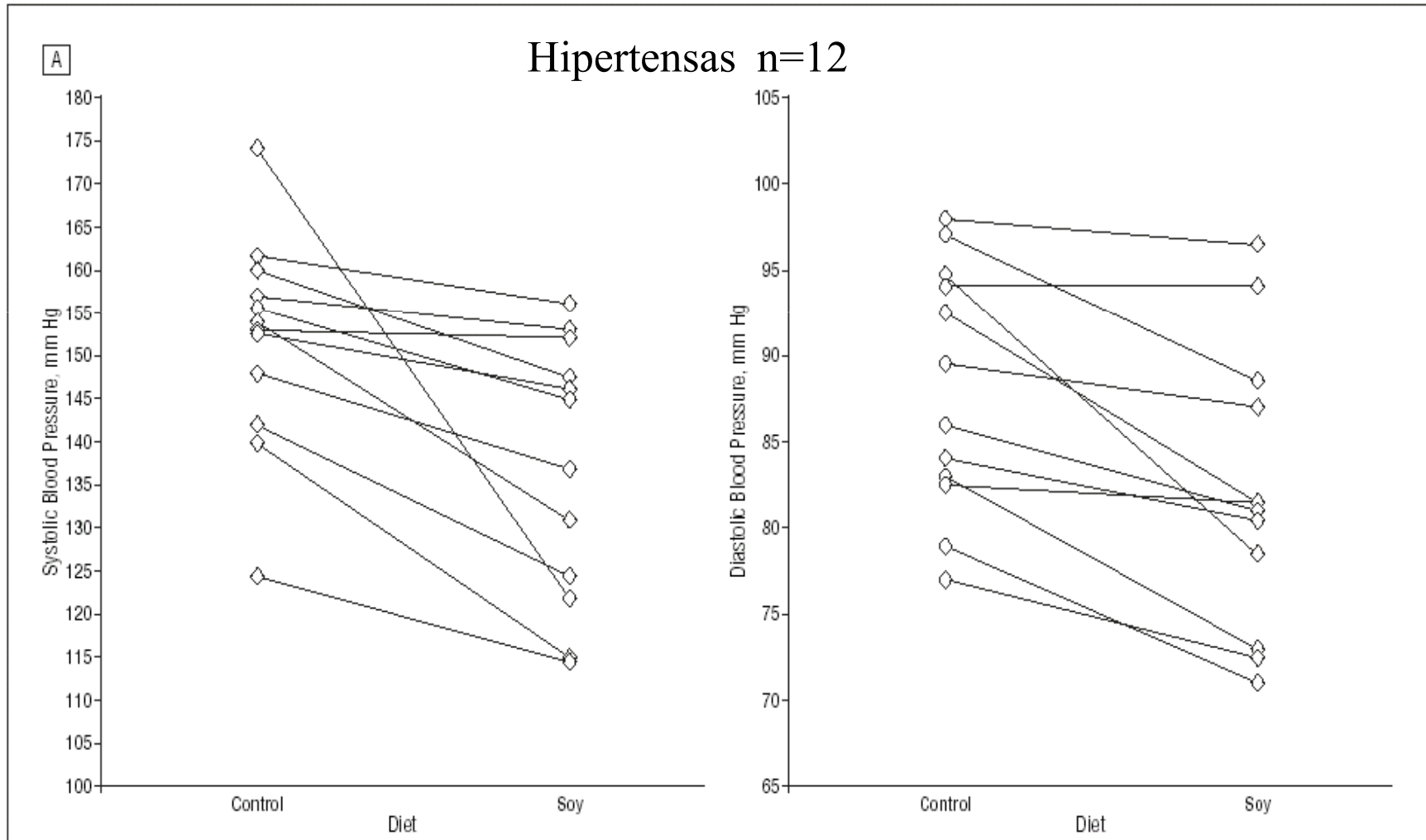
**Table 3. Isoflavone Concentrations in the Control vs Soy Diet Arms in Normotensive and Hypertensive Women\***

Isoflavone	Normotensive Women (n = 48)			Hypertensive Women (n = 12)		
	Control Diet	Soy Diet	P Value	Control Diet	Soy Diet	P Value
Diadzein	0.28 ± 0.66	21.25 ± 14.72 ↑	<.001	0.15 ± 0.17	14.92 ± 7.76 ↑	<.001
Genistein	0.43 ± 0.99	6.22 ± 8.39 ↑	<.001	0.21 ± 0.47	4.96 ± 3.715 ↑	.001
Equol	0.05 ± 0.19	3.97 ± 6.78 ↑	<.001	0	5.87 ± 7.11 ↑	.02
Glycitein	0.19 ± 0.68	1.61 ± 1.06 ↑	<.001	0.02 ± 0.04	1.04 ± 0.68 ↑	<.001
Enterolactone	2.70 ± 5.34	2.45 ± 3.81	.74	1.37 ± 2.06	1.41 ± 1.31	.95

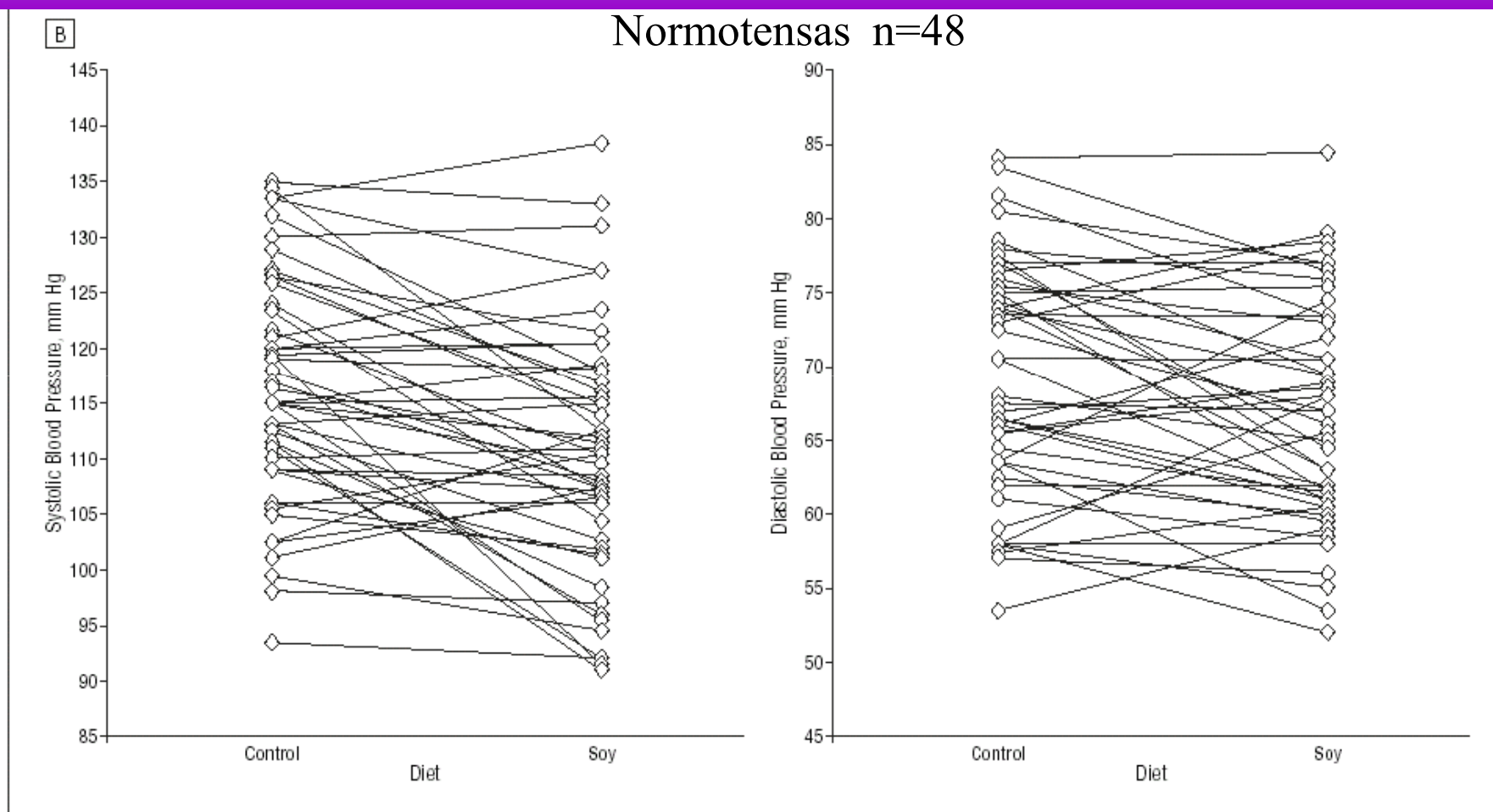
**Table 4. Dietary Intake in the Control vs Soy Diet Arms in Normotensive and Hypertensive Women\***

Dietary Intake	Normotensive Women (n = 48)			Hypertensive Women (n = 12)		
	Control Diet	Soy Diet	P Value	Control Diet	Soy Diet	P Value
Kilocalories	1399 ± 317	1554 ± 349	.002	1465 ± 358	1869 ± 626	.01
Total fat, g	23.8 ± 7.0	19.1 ± 7.2 ↓	<.001	29.8 ± 6.3	23.0 ± 8.1 ↓	.003
Saturated fat, g	7.5 ± 3.3	6.3 ± 2.9 ↓	.001	8.5 ± 2.4	6.6 ± 3.0 ↓	.01
Monounsaturated fat, g	7.4 ± 4.4	6.9 ± 2.3	.37	10.5 ± 2.8	8.6 ± 3.1	.09
Polyunsaturated fat, g	4.8 ± 2.7	7.4 ± 2.3 ↑	<.001	7.1 ± 2.5	8.3 ± 2.9	.18
Protein, g	16.8 ± 3.8	20.7 ± 4.0 ↑	<.001	18.4 ± 3.8	20.0 ± 3.5	.30
Carbohydrate, g	57.2 ± 3.8	53.3 ± 4.0 ↓	<.001	48.1 ± 5.5	48.1 ± 10.9	.99
Cholesterol, mg	142 ± 62	125 ± 81	.08	192 ± 41	182 ± 70	.60

# RESULTADOS



# RESULTADOS



**Figure.** Individual systolic and diastolic blood pressures after the control (Therapeutic Lifestyle Changes [TLC]) diet and the soy plus TLC diet for 8 weeks each in a crossover design for hypertensive (A) and normotensive (B) women.

# RESULTADOS

**Table 5. Blood Pressure, BMI, and Exercise at the End of Each Diet Period in Normotensive and Hypertensive Women\***

Variable	Normotensive Women (n = 48)				Hypertensive Women (n = 12)			
	Control Diet	Soy Diet	Change, %	P Value	Control Diet	Soy Diet	Change, %	P Value
Systolic BP, mm Hg	116 ± 10	110 ± 11	5.2↓	<.001	152 ± 12	137 ± 15	9.9↓	.003
Diastolic BP, mm Hg	69 ± 8	67 ± 7	2.9↓	.02	88 ± 7	82 ± 8	6.8↓	.001
BMI	25.7 ± 5.1	25.7 ± 5.1	None	.26	28.0 ± 4.3	27.7 ± 4.3	1.0↓	.14
Exercise, min/wk	156 ± 118	143 ± 120	NA	.09	127 ± 120	152 ± 128	NA	.08
Exercise, d/wk	4.0 ± 2.3	3.7 ± 2.4	NA	.14	3.2 ± 2.6	3.1 ± 2.5	NA	.38

**Table 6. Change in BP at the End of Each Diet Period in Normotensive Women Subdivided Into Prehypertensive and Normotensive Groups\***

Variable	Normotensive Women (n = 31)				Prehypertensive Women (n = 17)			
	Control Diet	Soy Diet	Change, %	P Value	Control Diet	Soy Diet	Change, %	P Value
Systolic BP, mm Hg	110 ± 7	105 ± 8	4.5↓	.003	127 ± 5	120 ± 9	5.5↓	.003
Diastolic BP, mm Hg	67 ± 7	65 ± 7	3.0↓	.06	73 ± 8	71 ± 8	2.7↓	.18
BMI	24.9 ± 4.7	25.0 ± 4.6	None	.21	27.2 ± 5.6	27.2 ± 5.7	None	.95
Exercise, min/wk	170 ± 153	156 ± 144	8.2↓	.19	163 ± 115	144 ± 114	11.7↓	.07
Exercise, d/wk	3.8 ± 2.3	3.5 ± 2.3	7.9↓	.31	4.5 ± 2.4	4.1 ± 2.5	8.9↓	.20

# RESULTADOS

Table 7. Lipid and Glucose Results at the End of Each Diet Period in Normotensive and Hypertensive Women\*

Variable	Normotensive Women				Hypertensive Women			
	Control Diet	Soy Diet	Change, %	P Value	Control Diet	Soy Diet	Change, %	P Value
Total-C, mg/dL	228 ± 39	224 ± 36	1.7↓	.28	248 ± 62	230 ± 45	7.5↓	.08
LDL-C, mg/dL	143 ± 32	142 ± 31	0.7↓	.55	164 ± 57	146 ± 46	11.0↓	.04
HDL-C, mg/dL	58 ± 15	59 ± 14	1.7↑	.21	56 ± 10	56 ± 11	None	.73
Triglycerides, mg/dL	128 ± 97	119 ± 83	7.0↓	.31	128 ± 74	114 ± 50	10.9↓	.29
Apolipoprotein B, mg/dL	111 ± 19	108 ± 24	2.7↓	.25	126 ± 37	116 ± 32	8.0↓	.04
Glucose, mg/dL	98 ± 10	97 ± 9	1.0↓	.30	97 ± 11	95 ± 12	2.1↓	.27

# CONCLUSÃO

In conclusion, soy nuts significantly lowered systolic and diastolic BP in normotensive and hypertensive postmenopausal women and lowered levels of LDL-C and apoB in hypertensive, hyperlipidemic women.