



UNIVERSITI PUTRA MALAYSIA

***EFFECTS OF ROASTED SOY NUT AND TEXTURED SOY PROTEIN ON
THE FEATURES OF METABOLIC SYNDROME AMONG ELDERLY
WOMEN IN BABOL, IRAN***

AFSANEH BAKHTIARY

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WOMEN IN BABOL, IRAN**

By

AFSANEH BAKHTIARY

**Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
Fulfillment of the Requirement for the Degree of Doctor of Philosophy**

May 2012

DEDICATION

**To the most glorious word in my word
“Father and Mother”**



Abstract of thesis to be presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirements for the degree of Doctor of Philosophy

EFFECTS OF ROASTED SOY-NUT AND TEXTURED SOY PROTEIN ON THE FEATURES OF METABOLIC SYNDROME AMONG ELDERLY WOMEN IN BABOL, IRAN

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Institute: Institute of Gerontology

Metabolic syndrome (MetS) consists of a constellation of factors that raise the risk for cardiovascular diseases (CVD) especially in elderly women. Owing to the complex pathophysiology and phenotypic expressions of MetS, diet is crucial as it is able to positively and simultaneously influence almost all components of the syndrome. As a plant-derived estrogen, soy can be useful in preventing CVD. Thus, this study was undertaken to determine the effects of roasted soy-nut and textured soy protein (TSP) on anthropometric measurements, blood pressure (BP), lipid profile and markers of glucose intolerance, as well as inflammatory and oxidative stress of elderly women aged 60-70 years with MetS in Babol, Iran.

This study involved a 12-week Randomized Clinical Trial (RCT). A total of 75 elderly women with MetS, who met the selection criteria, were randomized into three groups, namely, roasted soy-nut (n=25), TSP (n=25) and control (n=25) groups. During the intervention period, the treatment groups consumed 35gm of roasted soy-nut or TSP on

a daily basis. All the participants completed the entire study. Both the roasted soy-nut and TSP were well tolerated. Meanwhile, only five participants complained of feeling bloated when they consumed TSP.

Anthropometric measurements, which included weight, Body Mass Index (BMI), Waist Circumference (WC), Hip Circumference (HC), Triceps Skin Fold (TSF) thickness, Blood Pressure (BP), physical activity level and dietary intake, were measured at baseline and also every month during the intervention period. The metabolic biomarkers, which included lipid profiles [Triglyceride (TG), Total Cholesterol (TC), High Density Lipoprotein Cholesterol (HDL-C), Low Density Lipoprotein Cholesterol (LDL-C), Very Low Density Lipoprotein Cholesterol (VLDL-C)], Apolipoprotein AI (Apo AI), Apolipoprotein B100 (Apo B100), glucose intolerance markers [Fasting Blood Glucose (FBG), fasting insulin, HOMA-IR, TG/HDL-C], inflammatory and prothrombotic markers [C-Reactive Protein (CRP), fibrinogen], oxidative stress markers [Malondialdehyde (MDA), Total Antioxidant Capacity (TAC)] and serum isoflavone daidzein, were measured at baseline and also at the end of the study. In addition, demographic information was collected at baseline through a face -to -face interview.

There were no significant differences in the demographic characteristics, anthropometric measurements, BP and metabolic biomarkers of the participants at baseline. Due to the inclusion of 35-gm/day roasted soy-nut, the value of TSF increased significantly compared to the control group. Other anthropometric variables showed no significant changes in the treatment and control groups.

After intervention, the roasted soy-nut showed significantly improved LDL-C, VLDL-C and Apo B100 ($p < 0.05$), while those on TSP showed slight significant improvement, compared to the mean changes from the baseline ($p < 0.001$). Similar result was found for Apo AI in both groups ($p < 0.01$). In other words, the value of the change for AI in the treatment groups was significantly greater than that of the control group. Meanwhile, serum TC was significantly decreased in the treatment groups as compared with the control group ($p < 0.001$).

Similarly, the consumption of the roasted soy-nut significantly improved FBG, insulin and HOMA-IR after the intervention ($p < 0.05$), while the consumption of TSP showed a significant decrease only in serum insulin as compared to that of the control group ($p < 0.05$). There were also significant differences in the mean changes of FBG, insulin, HOMA-IR and TG/HDL-C ratio in the treatment groups compared to the control group ($p < 0.001$). The results also revealed that after consuming roasted soy-nut and TSP, the value of MDA was significantly lower, whereas more TAC was detected in the roasted soy-nut ($p < 0.001$) and the TSP ($p < 0.01$) groups compared to those of the control group.

The comparison of the two treatment groups showed that the mean changes for FBG, insulin and HOMA-IR levels in the roasted soy-nut group were significantly higher than that of the TSP group ($p < 0.01$), while the differences between the two groups were not significant for the lipid profiles and oxidative stress markers. Similarly, the differences in TG, HDL-C, fibrinogen, CRP and BP compared to the control group were also not significant.

In conclusion, short-term intakes of roasted soy-nut and TSP have shown to improve

the lipid profiles, markers of glucose intolerance and oxidative stress, although the roasted soy-nut contributed more effective than the TSP. Therefore, a moderate daily intake of roasted soy-nut as snacks or TSP as a meal complement may be a safe and a practical modality to reduce or prevent MetS complications among high risk individuals, especially elderly women.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doctor Falsafah

**KESAN SOYA PANGGANG DAN PROTEIN SOYA BERTEKSTUR
TERHADAP SINDROM METABOLIK DALAM KALANGAN WANITA DI
BABOL, IRAN**

Oleh

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Sindrome metabolik (MetS) terdiri daripada sekumpulan faktor yang meningkatkan risiko penyakit kardiovaskular (CVD) terutamanya dalam kalangan wanita warga tua. Disebabkan oleh patofisiologi dan ekspresi fenotip MetS yang kompleks, diet adalah penting kerana ia mampu mempengaruhi secara positif dan dalam masa yang sama hampir semua komponen sindrom. Sebagai estrogen terbitan-tumbuhan, soya adalah berguna dalam pencegahan penyakit kardiovaskular. Oleh itu, Kajian ini telah dijalankan untuk menentukan kesan soya panggang kacang soya dan protein soya bertekstur (TSP) pada ukuran antropometri, tekanan darah (BP), profil lipid dan penanda intoleransi glukosa, serta radang dan tekanan oksidatif wanita warga tua berumur 60-70 tahun yang mengalami MetS di Babol, Iran.

Kajian ini melibatkan Percubaan Klinikal Rambang (RCT) selama 12 minggu. Sejumlah 75 wanita warga tua yang mengalami MetS, yang memenuhi kriteria pemilihan, diagih secara rawak kepada tiga kategori, iaitu, kumpulan kacang soya

panggang (n=25), TSP (n=25) dan kawalan (n=25). Dalam tempoh intervensi, kumpulan rawatan mengambil 35 g kacang soya-panggang atau TSP pada setiap hari. Semua peserta melengkapkan kajian keseluruhan. Kedua-dua kacang soya panggang dan TSP boleh diambil tanpa masalah. Sementara itu, hanya lima peserta mengadu berasa kembung apabila mereka mengambil TSP.

Pengukuran antropometri, termasuk berat badan, Indeks Jisim Badan (BMI), Lilitan Pinggang (WC), Lilitan Punggung (HC), ketebalan Lipatan Kulit Trisepts (TSF), Tekanan Darah (BP), tahap aktiviti fizikal dan pengambilan makanan, diukur pada garis dasar dan juga setiap bulan dalam tempoh intervensi. Penanda metabolik, yang termasuk profil lipid [trigliserida (TG), Jumlah Kolesterol (TC), kolesterol Lipoprotein Ketumpatan Tinggi (HDL-C), kolesterol lipoprotein Ketumpatan Randah (LDL-C), lipoprotein Kolesterol Ketumpatan Sangat Rendah (VLDL-C)], Apolipoprotein AI (Apo AI), Apolipoprotein B100 (Apo B100), penanda intoleransi glukosa [Glukosa Darah Puasa (FBG), insulin puasa, HOMA-IR, TG / HDL-C], penanda radang dan prothrombotic [C-Reaktif Protein (CRP), fibrinogen], penanda tekanan oksidatif [Malondialdehyde (MDA), Kapasiti Antioksidan Jumlah (TAC)] dan serum isoflavone daidzein, diukur pada garis dasar dan juga pada akhir kajian. Di samping itu, maklumat demografi telah dikumpulkan pada garis dasar melalui temubual bersemuka.

Terdapat tiada perbezaan signifikan ciri-ciri demografi, pengukuran antropometri, BP dan penanda metabolik peserta pada garis dasar. Disebabkan oleh pengambilan 35-gm/hari kacang soya, nilai TSF dalam kumpulan rawatan meningkat dengan signifikan berbanding dengan kumpulan kawalan. Pembolehkan antropometri yang lain tidak menunjukkan sebarang perubahan signifikan dalam kumpulan rawatan dan kawalan.

Selepas intervensi, kacang soya panggang menunjukkan peningkatan yang signifikan LDL-C, VLDL-C dan Apo B100 ($p < 0.05$), manakala mereka yang mengambil TSP menunjukkan peningkatan signifikansi yang sederhana berbanding dengan perubahan min pada garis dasar ($p < 0.001$). Hasil yang sama telah diperolehi untuk Apo AI dalam kedua-dua kumpulan ($p < 0.01$). Dalam lain perkataan, nilai perubahan untuk Apo AI dalam kumpulan rawatan adalah jauh lebih besar daripada kumpulan kawalan. Sementara itu, serum TC ketara menurun dengan signifikan dalam kumpulan rawatan berbanding dengan kumpulan kawalan ($p < 0.001$).

Begitu juga, penggunaan kacang soya panggang secara signifikan memberi kesan yang baik terhadap FBG, insulin dan HOMA-IR selepas intervensi ($p < 0.05$), manakala penggunaan TSP menunjukkan penurunan yang signifikan hanya untuk insulin serum berbanding dengan kumpulan kawalan ($p < 0.05$). Terdapat jugat perbezaan yang signifikan dalam perubahan min FBG, insulin, HOMA-IR dan TG / nisbah HDL-C dalam kumpulan rawatan berbanding dengan kumpulan kawalan ($p < 0.001$). Keputusan juga menunjukkan bahawa selepas pengambilan kacang soya panggang dan TSP, nilai MDA adalah jauh lebih rendah, manakala lebih TAC telah dikesan dalam kumpulan kacang soya panggang ($p < 0.001$) dan TSP ($p < 0.001$) dibandingkan dengan kumpulan kawalan.

Perbandingan dua kumpulan rawatan menunjukkan bahawa perubahan min bagi tahap FBG, insulin dan IR HOMA dalam kumpulan kacang soya panggang adalah jauh lebih tinggi daripada kumpulan TSP ($p < 0.001$), manakala perbezaan di antara kedua-dua kumpulan tidak signifikan bagi profil lipid dan penanda tekanan oksidatif. Begitu juga,

perbezaan untuk TG, HDL-C, fibrinogen, CRP dan BP dibandingkan dengan kumpulan kawalan juga tidak signifikan.

Kesimpulannya, pengambilan jangka pendek kacang soya panggang dan TSP telah menunjukkan kesan yang baik untuk profil lipid, penanda intoleransi glukosa dan tekanan oksidatif, walaupun kacang soya panggang menyumbang dengan lebih berkesan daripada TSP. Oleh itu, pengambilan harian secara sederhana kacang soya panggang sebagai snek atau TSP sebagai pelengkap hidangan mungkin selamat dan cara yang praktikal untuk mengurangkan atau mencegah komplikasi sindrom metabolik dalam kalangan individu berisiko tinggi, terutama wanita warga tua.

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I certify that a Thesis Examination Committee has met on 26 June 2012 to conduct the final examination of Afsaneh Bakhtiary on her thesis entitled “**Effects of Roasted soy-nut and Textured Soy Protein on the Features of Metabolic Syndrome among Elderly Women in Babol, Iran**” in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the degree of Doctor of Philosophy.

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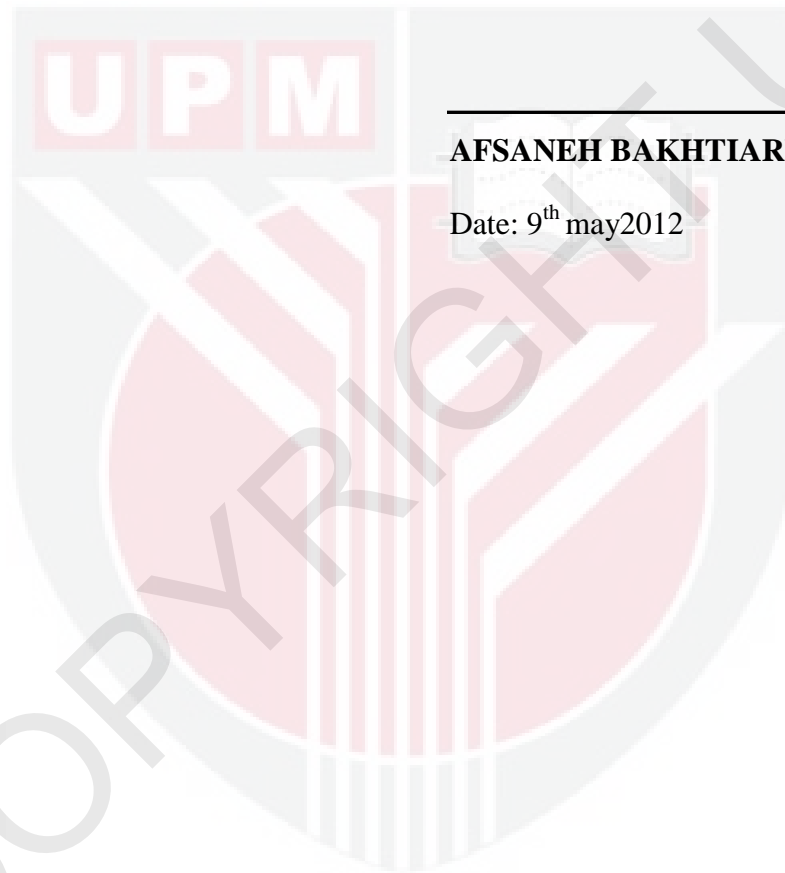
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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously and is not concurrently, submitted for my other degree at Universiti Putra Malaysia or other institutions.



AFSANEH BAKHTIARY

Date: 9th may2012

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