



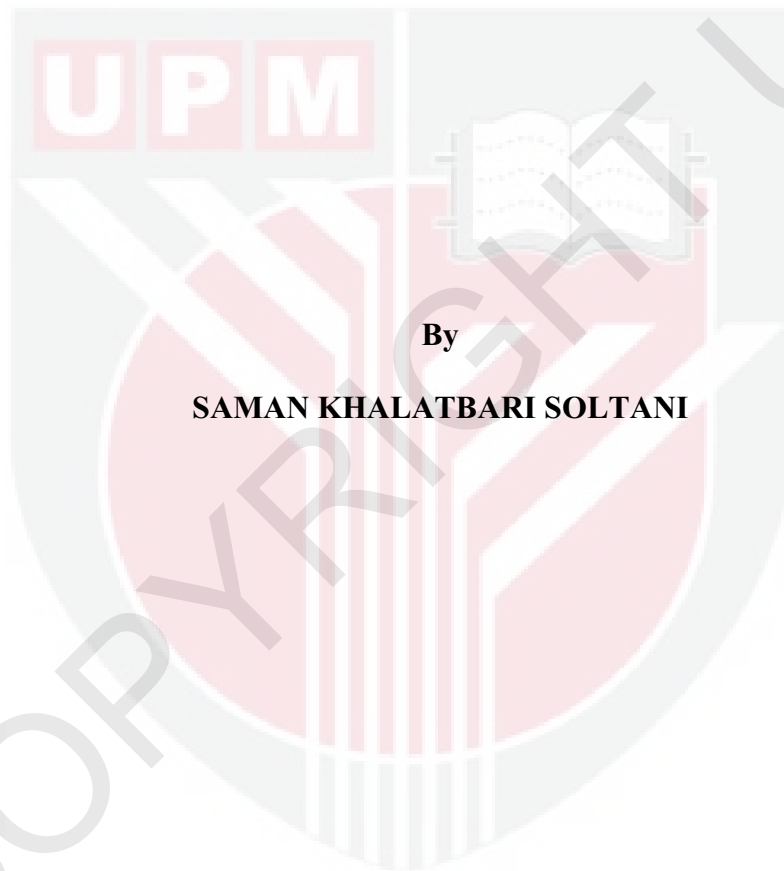
UNIVERSITI PUTRA MALAYSIA

**EFFECTS OF GROUND FLAXSEED SUPPLEMENTATION ON
CARDIOVASCULAR DISEASE AMONG HEMODIALYSIS PATIENTS AT A
GOVERNMENT HOSPITAL, IN TEHRAN, IRAN**

SAMAN KHALATBARI SOLTAN

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By

SAMAN KHALATBARI SOLTANI

**Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of the Requirements for the Degree of Master of Science**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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Chairman: Rosita Binti Jamaluddin, PhD

Faculty: Medicine and Health Science

The leading cause of death in patients with chronic kidney disease including dialysis patients is cardiovascular disease (CVD). Approximately 50% of deaths in these patients are related to CVD. Among patients undergoing hemodialysis (HD), one of the major risk factors for CVD is lipid abnormalities. Besides, low level of serum albumin and high concentration of serum systemic inflammation markers, especially C-reactive protein (CRP) are important risk factors for CVD among patients undergoing HD.

The present study was conducted to investigate the effects of flaxseed supplementation on cardiovascular risk factors among patients undergoing HD. This was a randomized interventional study involving 38 patients on maintenance HD (20

males, 18 females) with lipid abnormalities (Triglyceride > 2.26 mmol/L and/or high density lipoprotein-cholesterol < 1.1 mmol/L) in the age range of 23 to 77 years. Patients enrolled in the study did not have diabetes, inflammatory diseases, or infection disease, and none of them received omega-3 fatty acid supplement and lipid lowering drugs. They were randomly assigned to either a flaxseed or control group (n=19). Subjects in the flaxseed group received 40 g/d ground flaxseed for 8 weeks, whereas subjects in the control group consumed their usual diet, without any flaxseed supplementation. The outcomes of the study were evaluated at baseline, week 4 and 8. The primary outcomes were serum lipid profile, serum CRP and serum albumin levels. The secondary outcome measures were anthropometric measurements and dietary intake (assessed by 2- day record and one day food recall).

In this study, serum concentrations of triglyceride (TG; $p < 0.001$), total cholesterol (TC; $p < 0.01$), and low density lipoprotein-cholesterol (LDL-C; $p < 0.01$) decreased significantly within the flaxseed group over time by 30%, 14% and 17%, respectively. There were significant increases in serum concentrations of TG, TC, and LDL-C within the control group by 21%, 15% and 8%, respectively. The mean changes in serum TG, TC, and LDL-C were statistically significant from baseline to week 4 ($p < 0.05$) and 8 ($p < 0.001$) between the two groups.

Serum high density lipoprotein-cholesterol (HDL-C) and serum albumin increased significantly by 16% and 9%, respectively within the flaxseed group over time ($p < 0.01$). There was significant reduction in serum HDL-C and albumin level within the

control group over time by 10% and 5%, respectively. Serum CRP concentration reduced significantly by 31% within the flaxseed group over time ($p < 0.05$), whereas no significant change was observed in the control group. The mean changes in serum CRP was significant difference between the two groups ($p < 0.05$).

Baseline dietary intakes data were comparable with the exception of the control group having higher intake of dietary fiber than the flaxseed group ($p < 0.05$). At baseline, mean intakes of energy, protein, carbohydrate and dietary fiber in a large percentage of the subjects in both groups were lower than the recommended intakes. At week 8, subjects in the flaxseed group achieved the recommendation for energy (30.5 ± 9 kcal/ kg body weight/day), protein (1.2 ± 0.36 g/kg body weight/day) and dietary fiber (25 ± 4 g/d).

In conclusion, 40 g/d flaxseed supplementation for 8 weeks improved lipid profiles and serum albumin level and reduces systemic inflammation in patients on maintenance HD with lipid abnormalities in addition to an overall dietary improvement.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**KESAN SUPLEMENTASI BIJI FLAX TERHADAP PENYAKIT
KARDIOVASKULAR DI KALANGAN PESAKIT YANG MENJALANI
HEMODIALYSIS DI HOSPITAL KERAJAAN, TEHRAN, IRAN**

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Penyebab utama kepada kematian pesakit buah pinggang kronik termasuk pesakit yang sedang menjalani dialisis adalah penyakit kardiovaskular (PKV). Hampir 50% daripada kematian pesakit-pesakit ini berkaitan dengan penyakit kardiovaskular. Dalam kalangan pesakit yang sedang menjalani rawatan hemodialisis, salah satu faktor risiko utama penyakit kardiovaskular adalah ketidaknormalan lemak dalam darah. Disamping itu, tahap kepekatan serum albumin yang rendah dan penanda serum keradangan sistemik, terutamanya protein C-reaktif (CRP) yang tinggi merupakan faktor risiko penting bagi penyakit kardiovaskular dalam kalangan pesakit yang sedang menjalani hemodialisis.

Kajian ini dijalankan untuk mengkaji kesan suplemen biji flax ke atas faktor risiko penyakit kardiovaskular dalam kalangan pesakit yang sedang menjalani hemodialisis. Ini adalah satu kajian intervensi rawak yang melibatkan 38 orang pesakit yang sedang menjalani rawatan hemodialisis (20 lelaki, 18 perempuan) yang mempunyai ketidaknormalan lemak dalam darah (Trigliserida > 2.26 mmol/L dan/atau kolesterol lipoprotein berketumpatan tinggi <1.1 mmol/L) dalam lingkungan umur 23 hingga 77 tahun. Pesakit yang mendaftar dalam kajian ini tidak mempunyai kencing manis, penyakit keradangan atau penyakit jangkitan, dan tidak seorang pun daripada mereka menerima suplemen asid lemak omega-3 dan dadah yang mengurangkan lemak. Mereka dibahagikan secara rawak kepada kumpulan intervensi (diberikan suplemen biji flax) atau kumpulan kawalan (n=19). Pesakit dalam kumpulan intervensi menerima 40 g/hari suplemen biji flax selama 8 minggu, manakala pesakit dalam kumpulan kawalan hanya mengambil diet biasa tanpa suplemen biji flax. Hasil kajian telah dinilai pada permulaan, minggu ke-4 dan ke-8. Hasil utama adalah serum untuk profil lemak, CRP dan paras albumin. Hasil kedua yang diukur adalah ukuran antropometri dan pengambilan diet (dinilai dengan rekod pengambilan makanan selama 2 hari dan satu hari dengan mengingat makanan).

Dalam kajian ini, kepekatan serum trigliserida (TG; $p < 0.001$), jumlah kolesterol (TC; $p < 0.01$), dan kolesterol lipoprotein berkepadatan rendah (LDL-C; $p < 0.01$) menurun dengan ketara dalam kumpulan intervensi dengan masa masing-masing sebanyak 30%, 14% dan 17%. Terdapat peningkatan yang signifikan dalam serum TG, TC, dan LDL-C dalam kumpulan kawalan dengan masing-masing sebanyak

21%, 15% dan 8%. Min perubahan dalam serum TG, TC, dan LDL-C adalah signifikan secara statistik dari permulaan ke minggu ke-4 ($p < 0.05$) dan ke-8 ($p < 0.001$) antara dua kumpulan tersebut.

Serum kolesterol lipoprotein berketumpatan tinggi (HDL-C) dan albumin meningkat dengan signifikan masing-masing sebanyak 16% dan 9% dalam kumpulan intervensi dengan masa ($p < 0.01$). Terdapat penurunan yang signifikan dalam serum HDL-C dan albumin dalam kumpulan kawalan dengan masa masing-masing dengan 10% dan 5%. Kepekatan serum CRP berkurang dengan signifikan sebanyak 31% dalam kumpulan intervensi dengan masa ($p < 0.05$) dimana tiada perubahan yang ketara dilihat dalam kumpulan kawalan. Min perubahan dalam serum CRP adalah berbeza secara signifikan antara dua kumpulan ($p < 0.05$).

Data permulaan bagi pengambilan makanan dibandingkan dengan pengecualian dari kumpulan kawalan yang mempunyai lebih tinggi pengambilan serat daripada kumpulan intervensi ($p < 0.05$). Pada permulaan, min pengambilan tenaga, protein, karbohidrat dan serat makanan dalam peratusan yang besar yang diambil oleh subjek dalam kedua-dua kumpulan adalah lebih rendah daripada pengambilan yang disyorkan. Pada minggu ke-8, subjek dalam kumpulan intervensi telah mencapai tahap pengambilan yang disyorkan untuk tenaga (30.5 ± 9 kkal/kg berat badan/hari), protein (1.2 ± 0.36 g/kg berat badan/hari) dan serat (25 ± 4 g/hari).

Kesimpulannya, suplemen biji flax sebanyak 40 g/hari selama 8 minggu boleh

memperbaiki profil lemak dalam darah dan paras serum albumin serta mengurangi peradangan sistemik dalam kalangan pesakit yang sedang menjalani hemodialisis yang mempunyai ketidaknormalan lemak dalam darah di samping memperbaiki keseluruhan pengambilan makanan.



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