Protective Effect of Sesame, and FlaxSeed on Prednisone-Induced Osteoporosis

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Abstract

Osteoporosis is a particularly prevalent ailment among menopausal women. Since bone mineral density (BMD) declines with age, primary osteoporosis primarily affects women 10-15 years after menopause. Once, the research's goal was to investigate how flax seed and sesame powder affected osteoporosis in rats. In this study, 35 female albino rats that weigh 150±5 g were split up into six groups of five rats each. The first was kept as a control -ve group, while the other five were given prednisone at a rate of 4.5 mg per kg (over the course of two weeks) to induce osteoporosis. The second group of rats served as the positive control group. Other treated groups fed on 2.5 and 5% sesame, flax seeds, and their mixtures. When the experiment finished, the rats had been fasting for the previous day. before being sacrificed, and blood was gathered and then centrifuged to separate the serum. Lipid profile including cholesterol, triglycerides, HDL, LDL and VLDL, kidney functions, and do a dexa scan of the appropriate femur taken; BMD and BMC of measure the BMD and BMC of every bone; and use part of the bone to estimate the amount of calcium and phosphorus in the body. The data collected

demonstrated that treated groups with 5%mixtures of flax seed and sesame led to a significant decrease in all lipid cholesterol and renal biomarkers, and vice versa with HDL-c, BMD, BMC, calcium, and phosphorus.

Key words: Bone mass, Rats, sesame, flax seed and Biochemical analysis.

INTRODUCTION

Bone mass that is below the standard levels and microarchitectural degradation of bone tissue are two characteristics of osteoporosis, a systemic skeletal disease that increases bone fragility and fractures following minor trauma **(Tümay *et al.,* 2017)**. Based on bone densitometry, an expert team assembled through the World Health Organization created the following definition of osteoporosis: Osteopenia is defined as a BMD measurement that is greater than 1.0 but not over 2.5 SD fewer than younger normal people mean around the hip, vertebrae, or distal forearm, and osteoporosis is defined as a BMD that is greater than 2.5 SD less the younger normal people mean at one of the three sites **(Cosman *et al.,* 2021)**. Osteoporotic fractures are categorized as fragile fractures because they happen in circumstances where healthy individuals would not typically break a bone. The term "porous bones" refers to the vertebral column, rib, hip, and wrist, which are all common sites for fragility fractures. appear to influence the risk of dying **(Melton *et al.,* 2023)**. To calculate the international incidence of osteoporosis, an operational description of the disease was created. Currently, it is utilized in clinical settings to identify women who need osteoporosis treatment or prevention. Osteoporosis is a disorder in which poor bone structure and slowly declining bone mass increase bone fragility and the risk of fracture, especially of the wrist, hip, and spine **(WHO 2016)**. A lower-than-average maximal bone mass and greater-than-average bone loss could be the causes of osteoporosis. Because of decreasing amounts of estrogen after menopause and testosterone following "andropause," bone loss accelerates **(Hannan *et al.,* 2018)**. A healthy diet during youth, hormone replacement therapy for menopausal women, and efforts to avoid drugs that quicken bone loss are all part of the prevention of osteoporosis. With osteoporosis, prophylactic measures such as a healthy diet, exercise, and fall avoidance are used to decrease the danger of fractured bones. Making lifestyle adjustments like giving up alcohol and smoking could be beneficial **(Watts *et al.*, 2014)**.

The most frequent iatrogenic factor, the most prevalent reason for secondary osteoporosis by fifty decades old, and the most prevalent source of osteoporosis is glucocorticoid-induced osteoporosis (GIOP). The intake of glucocorticoids (GCs) in the past and present increases the risk of fracture and deterioration of bones. According to **Roux (2011)**, bone frailty in GIOP is characterized by rapid bone loss that leads to the development of GCs and a discrepancy between the density of bone minerals and the possibility of breaking. Sesame seeds have traditionally been used to produce sesame seed oil and nutritious foods. The essential elements calcium, iron, manganese, phosphorus, magnesium, selenium, and copper are abundant in sesame seeds. These minerals are vital for the proper functioning and development of bones. Among the more stable vegetable oils, sesame oil has a high concentration of the natural antioxidants lignans, sesamin, sesamolin, and sesamol. Sesame seed oil has reportedly been shown to prevent the breakdown of bones in mice with ovariectomies **(Boulbaroud *et al.*, 2008)**. According to research by **Wanachenwin *et al.*, (2012)**, sesamin has the potential to enhance osteoporotic treatment by promoting osteoblast development and producing an osteoprotective impact. Sesame- and excessively calcium-fortified diets had positive effects on the prevention of osteoporosis in rats with ovariectomies. According to research, adding sesame seeds and oil to baked goods and food items and consuming calcium-rich foods like dairy items (milk and yoghurt) may both be beneficial for treating postmenopausal osteoporosis in women **(Ramadan, 2014)**. Sesame seeds should have an anti-osteoporotic effect since they contain excessive amounts of important minerals, including calcium and phosphorous, which are vital for the mineralization of bones. The seeds also contain high levels of natural antioxidant lignans which prevent bone loss in rats with ovariectomies. Additionally, it was once believed that high levels of calcium and foods low in vitamin D3 were essential for bone mineralization and the prevention of osteoporosis **(Chen *et al.,* 2013)**.

For a considerable length of time, flax seeds (*Linum usitatissimum*) were suggested in the human eating routine on account of their high content of parts helpful for human wellbeing. Other than polyunsaturated unsaturated fats, they contain generally high amounts of secoisolariciresinol diglucoside (SDG), phenolic and flavonoid compounds. Flax oil basically contains high polyunsaturated unsaturated fats alpha-linolenic corrosive (ALA) and linoleic corrosive (LA). It has shown that an abnormal state of ALA in the eating regimen can diminish the danger of malignancy and cardiovascular sickness and breaking the point of creation of arachidonic acids and other expert incendiary eicosanoids **(Karcher *et al.,* 2014)**. Flaxseed is viewed as a notable example of the extravagant wellspring of lignans and phytoestrogens **(Setchell *et al.,* 1981)**. **Bhatia *et al.,* (2007)** recommended that the safety provided by flax seed may be attributed to its components, that involve omega-3 fundamental unsaturated fats and phytoestrogenic lignans, which seem to assume a significant role in free radical searching. **Sacco *et al.,* (2009)** announced that flaxseed incorporation, either individually or collectively blended with low-portion estrogen, likewise positively modified lipid fractions in the femur and spine via expanding -3 and diminishing -6 polyunsaturated fatty acids, which is accepted to be useful for bone arrangement by expanding calming and repressing proinflammatory eicosanoid generation. Flaxseed flour contains high alpha-linolenic acid (ALA) concentrations. For osteoblasts, ALA protects bone mass by expanding the articulation of key interpretation factors, for example, osteocalcin, which improves preosteoclasts' separation into osteoblasts and bone formation. ALA produces a contrary effect: it stimulates osteoclast genesis and decreases osteoblast genesis. Other than ALA, flaxseed flour includes a high calcium amount of 236 mg/100 g of seed, ALA expands calcium retention in the gut, advancing mineral buildup in bones **(Pessanha *et al.*, 2016)**. Finally, flaxseed powder incorporation is advised to prevent osteoporosis caused by glucocorticoids as well as several other side effects. In the past, incorporates were even more effective at increasing bone mineral density **(Eman *et al.*, 2019)**.

Thus, in this study, we are attempting to find out how sesame and flax seeds do as sources of phytoestrogens in preventing glucocorticoid-induced osteoporosis and improving serum calcium, phosphorus, and other related parameters.

Material and Methods

Materials

Source of sesame and flax seeds

Flaxseed and sesame were obtained from a local market in Shibin El Kom City, Menoufia Governorate, Egypt.

Experimental animals

Vaccine and Immunity Organization, Ministry of Health, Helwan Farm, Cairo, Egypt, provided a total of 35 adult normal female albino rats of he "Sprague Dawley" strain weighing 150±10 g.

Casein, cellulose, choline chloride, and DL- methionine

Morgan Co., Cairo, Egypt, delivered casein, cellulose, choline chloride powder, and DL-methionine powder.

Chemicals and kits

SIGMA Chemical Co., Egypt, provided pure white crystalline cholesterol powder and saline solutions. Morgan Co., Cairo, Egypt, provided casein, cellulose, choline chloride powder, and DL methionine powder. Al-Gomhoria Company for Trading Drugs, Chemical and Medical Instruments, Cairo, Egypt, provided the chemical kits (TC, TG, HDL-c, urea, and creatinine, calcium, phosphorus, bone mineral, BMD, and BWC) utilized in this examination.

Methods

Preparation of sesame and flax seed powder

Sesame and flaxseed were purchased for preparation from a nearby market in January 2023. sesame and flaxseed were obtained, dried at 60 º C in an air oven dryer, then ground it into a powder, then put in bags until they were.

The induction of experimental osteoporotic rats

Prednisone was injected into the rats, who served as the positive control group, at a rate of 4.5 mg per kg (over the course of two weeks). **(Liu *et al.*, 2013).**

Identification of phenolics compounds using HPLC:

High-performance liquid chromatography (HPLC) (Agilent 1100, Palo Alto, USA) had been used to analyse the content and concentration of phenolic chemicals in the extracts by **(Natsume *et al.*, 2000)**. An auto injector, degasser, quaternary pump, and diode-array detection (DAD) make up the HPLC system. Bioactive chemicals were separated using a reversed-phase, C18 column (250 mm4 mm, 5 mI.D., Alltech, Licosphere, United States). The analyses were conducted using a mobile phase made up of two solvents: Solvent A contains water and trifluoroacetic acid at a ratio of 99.9:0.1, while Solvent B contains acetonitrile and trifluoroacetic acid at a ratio of 99.9:0.1, respectively. In the past, the gradient elution was conducted as follows: The analysis was conducted using the following parameters: flow rate of 0.8 ml/min, 0 -10% (A) for 5 min, 10-25% (A) for 25 min, and 25 -100% (A) for 5 min. A PDA detector was used to record the UV spectra of the eluted chemicals within the range of 280–360 nm. Micropore 0.45 m filters were used to separate the extracts. Using an injection valve made by Rheodyne (model 7725i), 20-l aliquots of the filtrate have been quickly pumped into the column. With five microscans and a superior ion time injection of 200 ms, the SIM analysis was examined in this experiment in the m/z range of 100 to 700. Helium collision gas was used in the MS-MS analysis process in accordance with the manufacturer's specifications. **(La-Torre *et al.*, 2006)**.

Experimental design

The research was once conducted in an animal house at the University of Menoufia in Egypt, which has been authorized, by the Department of Nutrition and Food Science, Faculty of Home Economics according to the ethical approval of the Science Research Ethics Committee of the Faculty of Home Economics, which cleared the study protocol #21-SREC-04-2022.

Thirty-five adult female rats aged 5 months (SD) were purchased from the Vaccine and Immunity Organization and kept for 7 days on a basal diet (adaptation period) in accordance with **AIN, (1993)**, After the adaptation period, the 35 rats were classified into seven groups: group1 (5 rats), which was kept on a basal diet, and the experimentally infected group (2 to 7) Prednisone was injected into the rats, at a rate of 4.5 mg per kg (over the course of two weeks) to induce osteoporosis, Group 2, which served as the positive control group, kept on a basal diet. The third and fourth groups fed on a dietscontaining 2.5% and 5% respectively. The fifth and sixth groups fed on a diets containing 2.5% and 5% flaxseed, respectively and seventh group fed on their mixtures 5% sesame and flaxseed the experiment was continued for 28 days

Blood sampling:

Blood samples were first taken from the retro orbital vein after a 12-hour fast. In order to analyse the blood samples, the serum was properly aspirated into clean cuvette tubes and frozen. Blood samples were drawn into glass centrifuge tubes, which were dry and clean, and allowed to coagulate for 30 minutes in a water bath (37°C).. according to the method described by **Schermer (1967)**.

Taken samples from the right femur of each rat, then the samples were washed in a water solution, then tested for DEXA of the right femur taken;

BMD and BMC of every bone measured; and use part of the bone to estimate the amount of calcium and phosphorus in the body.

Lipids profile:

Determination of total cholesterol:

The colorimetric method described by **Thomas (1992)** was used to determine serum total cholesterol.

Determination of serum triglycerides:

The serum triglyceride level was determined using an enzymatic method and kits. according to the **Young, (1975) and Fossati & Prencipe (1982)**.

Determination of high-density lipoprotein (HDL-c):

HDL-c was measured using the method described by **Friedewaid (1972) and Grodon and Amer (1977)**.

VLDL-c (very low-density lipoprotein cholesterol) was calculated in milligrams per deciliter in accordance with **Lee and Nieman (1996)** by applying the following formula:

VLDL-c (mg/dl) = Triglycerides / 5

Calculation of low-density lipoprotein cholesterol (LDL-c):

LDL-c was calculated in mg/dl according to **Lee and Nieman (1996)** as follows:

LDL-c (mg/dl) = Total cholesterol – HDL-c – VLDL-c

Kidney functions

Determination of serum urea

Enzymatic methods were used to determine serum urea, uric acid and creatinine according to **(Henary, 1974, Barham & Trinder 1972** and **Patton & Crouch 1977)**.

Statistical analysis:

When a significant main effect was found, the data were examined using a fully randomized factorial design **(SAS, 1988)**, and the means were separated using the Student-Newman-Keuls test. Using the Costat Program, differences between treatments that were ($P \leq 0.05$). were deemed significant. One Way ANOVA was used to assess the biological results.

RESULTS AND DISCUSSION

Data tabulated in Table (1) confirmed the identification in phenolic compounds of sesame and flax seeds by way of HPLC techniques. The bought outcomes indicated that the perfect phenolic compounds recognized in flax seeds were seco-iso lariciresinol di-glucoside, and *P*-coumaric acid. The values had been 326.17, and 13.59 mg /100g DW, respectively. As opposed to that, the less compound phenols recognized in flax seeds had been recorded for *P*-hydroxybenzoic acid and vanillic acid. The values have been 0.75, and 0.81 mg/100g DW, respectively.

Regarding sesame seeds, records shown that the best compound phenols recognized in sesame seeds were ellagic acid, catechin and *P*- hydroxybenzoic acid. The values had been 1017.00, 276.50 and 88.40 mg/100g DW, respectively. As opposed to that, the less compound phenols recognized in sesame seeds were pyrogallol, hydroxycinnamic acids and *p*-coumaric acid. The values had been 1.87, 6.42 and 6.47 mg/100g, respectively. These outcomes support the research results found by **Hu *et al.*, (2007)** who concluded that the flax seed lignans' antioxidant capabilities are what provide them with their health benefits. The antioxidant qualities of seco-iso lariciresinol di-glucoside are related to the suppression of oxidative states that are increased by oxygen species. Seco-iso lariciresinol di-glucoside and seco-isolariciresinol, its aglycone, possess an extremely potent antioxidant action, protecting against the destruction of DNA and liposomes at a stage in the metabolism of colon microbes that changes them into human lignans.

Additionally, **El-Roby *et al.*, (2020)** showed that the majority of important phenolic components in sesame were coumaric acid, ellagic acid, and catechin. The ability of specific sesame varieties as well as unique elements, such as fertilized soil and sunlight, may also have an impact on the existence of phenolic chemicals.

Table (1): Phenolic compounds of sesame and flax seeds

Phenolic compounds	Concentration mg/100g DW	
	Sesame	Flax seeds
***P*-Coumaric acid**	6.47	13.59
Gallic acid	40.20	2.25
Ferulic acid	ND	8.25
Caffeic acid	13.84	3.15
Seco-iso lariciresinol di-	ND	326.17
glucoside	6.42	2.16
Hydroxycinnamic acids	ND	1.23
Glutaric acid	ND	1.50
Sinapic acid	19.15	0.93
Protocatechuic acid	88.40	0.75
***P*- hydroxybenzoic acid**	4.20	0.81
Vanillic acid	22.16	ND
Synergic acid	1.87	ND
Pyrogallol	1017.0	ND
Ellagic acid	276.50	ND
Catechin	74.18	ND
Chlorogenic acid		

ND = Not detectable

Data in Table (2) depicts the effect of sesame and flaxseed on bone mineral density (BMD) and bone mineral content (BMC) in osteoporotic rats. The control –ve control group had significantly higher mean BMD and BMC levels than the control (+) group (P≤0.05). All osteoporotic rats fed on different diets revealed a significant rise in mean values as compared to control (+) group. The best treatment of BMD and BMC was recorded for group 7 (5% mixture powder) when compared to the control positive group. Three studies were looked at by **Mihir *et al.*, (2005)** to see how flaxseed affected menopausal women's bone health. A randomized, double-blind, integration trial found that postmenopausal women who consumed 38 g of flaxseed per day for six weeks saw a significant decline in the activity levels of the enzyme serum tartrate-resistant acid phosphatase, a measure of bone disintegration.

Additionally, **Tachibana *et al.*, (2020)** found that feeding ovariectomized rats food supplements including sesame seed methanol extracts reduced femur BMD even more than control-fed rats. Bone histomorphometry has also shown that these supplements reduce bone formation while increasing other aspects of bone formation, such as bone formation rate and mineralizing surface. These results suggest that eating sesame seeds may also no longer slow down bone loss in postmenopausal women, but rather speed it up.

Additionally, animals in the experiment group who received calcium from irradiation sesame at a rate of 1 g/d had noticeably higher femur BMD. The BMD of the femur appeared to be significantly higher in the two groups. The initial femur BMD of the test group was significantly higher than that of the control group. The studies show that rats used to correctly absorb and utilize calcium from UV-irradiated sesame **(Viraj and Conrad, 2016)**.

Table (2): Influence of sesame and flaxseed on BMD and DMC in osteoporotic rats

Treatment/Parameter	BMD (mg/dl)	DMC (mg/dl)
Control –ve (G1)	$0.18^{b} \pm 0.003$	$0.076^{a} \pm .003$
Control +ve (G2)	$0.072^{e} \pm 0.012$	$0.025^{f} \pm 0.11$
2.5% sesame (G3)	$0.127^{d} \pm 0.001$	$0.036^{e} \pm 0.072$
5% sesame (G4)	$0.158^{c} \pm 0.002$	$0.045^{d} \pm 0.005$
2.5% flaxseed (G5)	$0.135^{d} \pm 0.004$	$0.057^{c} \pm 0.018$
5% flaxseed (G6)	$0.96^{a} \pm 0.006$	$0.076^{b} \pm 0.002$
5 % Mixture of flaxseed, sesame(G7)	$0.97^{a} \pm 0.015$	$0.060^{c} \pm 0.004$
L.S.D (p≤0.05)	**0.016**	**0.004**

BMD:Bone Mineral Density. BMC:Bone Mineral content.

Each value is represented as mean ± standard deviation

Mean under the same column bearing different superscript letters are different significantly (P≤ 0.05).

Data shown in Table (3) depicts the impact of sesame, and flaxseed on bone mineral (calcium and phosphorus) in osteoporotic rats. The findings revealed that the positive control group's mean calcium and phosphorus levels were significantly (P≤0.05) improved, and all osteoporotic rats fed on different diets revealed significant improvements in mean values as compared to the control (+) group. These results agree with those from **Abbas *et al.* (2016)** who mentioned that sesame was also one of the ancient foods, as shown by calcium and phosphorus.

The effect of four calcium-rich supplies on the release of postprandial parathyroid hormone was assessed by **Karkkainen *et al.* (2020)**. included milk, sesame nuts, Emmental cheese, and Ca salt (calcium lactate gluconate + calcium carbonate) in 9 healthy girls (aged 24 to 34). The investigators concluded that the Calcium in spinach and sesame seeds no longer causes acute renal damage.

Table (3): Influence of sesame and flaxseed on bone mineral (calcium and phosphorus) in osteoporotic rats

Treatment/Parameter	Calcium (mg/dl)	Phosphorus (mg/dl)
Control –ve (G1)	$5.77^{a} \pm 0.153$	$2.57^{a} \pm 0.025$
Control +ve (G2)	$3.13^{e} \pm 0.252$	$1.52^{e} \pm .026$
2.5% sesame (G3)	$4.37^{d} \pm 0.289$	$2.53^{c} \pm .021$
5% sesame (G4)	$4.75^{c} \pm 0.020$	$2.27^{c} \pm .023$
2.5% flaxseed (G5)	$4.93^{bc} \pm 0.253$	$2,43^{b} \pm ,027$
5% flaxseed (G6)	$5.14^{b} \pm 0.026$	$2.56^{a} \pm .032$
5 % Mixture of flaxseed, sesame(G7)	$5.2^{b} \pm 0.267$	$1.90^{d} \pm .027$
L.S.D (P≤0.05)	**0.289**	**0.047**

Each value is represented as mean ± standard deviation .

Mean under the same column bearing different superscript letters are different significantly ($P \leq 0.05$).

Data offered in Table (4) illustrate the impact of sesame, and flax seed on serum triglycerides and total cholesterol in rats induced osteoporosis. The findings revealed that the positive control group's mean serum total cholesterol and triglyceride levels were significantly ($P \leq 0.05$) lower. All osteoporotic rats fed on different diets revealed significant decreases in mean values as compared to the control (+) group. The best treatment of total cholesterol and triglycerides was recorded for group 7 (5% mixture powder), when compared to the control positive group and other treated groups. **El-Baz *et al.*, (2015)** discovered that prophylactic doses of 5 and 10% black sesame seed oil reduced fats in hypercholesterolemic rat model systems by 196.30 and 206.15%, respectively. The LDL stage decreased as the supplied sesame oil doses rose. These results were consistent with other research suggesting that polyunsaturated and monounsaturated fatty acids may affect lipoprotein metabolism in hypocholesterolemic animals.

These results are consistent with those of **Cardozo *et al.*, (2010),** who found that adult rats given flaxseed flour constituents via breast milk throughout lactation had lower plasmatic amounts of total cholesterol and triglycerides.

Another study, **Riediger *et al.* (2008)**, observed that the reduction in blood cholesterol introduced by flaxseed in the weight loss plan may additionally be due to the phytochemicals included, such as phytosterols, at a level of 826 mg/kg dry weight. These phytosterols, in particular beta-sitosterols, are recognized to decrease plasma levels of lipoprotein and cholesterol by decreasing the solubility and intestinal absorption of cholesterol. This decreasing impact is added on by phytosterols' greater hydrophobicity, which permits them to mix with bile salts and acid micelles more conveniently than animal cholesterol. As a result, more unabsorbed cholesterol, especially low-density lipoprotein, is excreted with faeces.

Table (4): Effect of sesame, and flaxseed on serum total cholesterol and triglycerides of Osteoporotic rats

Treatment/Parameter	T.C (mg/dl)	T.G (mg/dl)
Control –ve (G1)	129.33^{g} ± 2.52	166·33^{e} ± 1.57
Control +ve (G2)	255.67^{a}± 1.53	218.67^{a}±1.53
2.5% sesame (G3)	211^{b} ± 1.52	207^{b} ± 2. 00
5% sesame (G4)	208^{c} ± 1.00	197.67^{c} ± 0.58
2.5% flaxseed (G5)	196.33^{d} ± 1.50	133.33^{f}± 2.65
5% flaxseed (G6)	190 ^{e} ± 1.02	169 ^{e} ± 3.61
5 % Mixture of flaxseed, sesame(G7)	186 ^{f}± 2.65	191 ^{d} ± 2.63
L.S.D (p≤0.05)	**3.33**	**4.09**

TG= Triglycerides. TC= Total cholesterol

Each value is represented as mean ± standard deviation .

Mean under the same column bearing different superscript letters are different significantly (P≤ 0.05).

Data presented in Table (5) depicts the effect of sesame, and flaxseed on the serum lipid profile levels in osteoporotic rats. The Control +ve control group had a significantly higher mean serum lipid profile (serum TC, TG, LDL-c, and VLDL-c) than the control (–) group control group (P≤0.05).All osteoporotic rats fed on different diets revealed significant decreases in mean values as compared to the control (+) group. The best treatment of serum lipid profile (serum TC, TG, LDL-c, and VLDL-c) was recorded for group 7 (5% mixture powder, when compared to the control positive group). Flax seed, sesame, and mushroom treatment for osteoporosis rats. Flax seed was found to lower total and HDL cholesterol levels while having a marginally larger influence on LDL cholesterol levels. These results support those of **Dodini *et al.* (2005)**, who discovered that postmenopausal women who supplemented with flaxseed (40 g/d for three months) had significantly lower serum whole cholesterol concentrations than those who took a placebo.

Rats were administered 18% sesame protein isolate for 28 days with or without 2% cholesterol to evaluate the hypocholesterolemic and antioxidant effects of sesame protein isolate, according to **Biswas *et al.* (2013)**. Dietary sesame protein isolate reduces plasma total cholesterol, triacylglycerol, and LDL-C, increases HDL-C, and reduces lipid peroxidation in both hypercholesterolemic and normocholesterolemic weight loss application groups.

Table (5): Influence of sesame and flaxseed on serum lipoproteins of osteoporotic rats

Treatment/Parameter	**LDL (mg/dl)**	**VLDL (mg/dl)**	**HDL (mg/dl)**
Control –ve (G1)	$25.73^{e} \pm 3.700$	$33.27^{e} \pm 0.306$	$33.8^{e} \pm 0.721$
Control +ve (G2)	$167.6^{a} \pm 2.01$	$43.73^{a} \pm 0.302$	$44.33^{e} \pm 1.511$
2.5% sesame (G3)	$101.93^{c} \pm 3.11$	$41.4^{b} \pm 0.400$	$68.0^{a} \pm 2.00$
5% sesame (G4)	$108.13^{c} \pm .643$	$39.53^{c} \pm 0.12$	$60.33^{b} \pm 1.522$
2.5% flaxseed (G5)	$115.4^{b} \pm 4.084$	$26.06^{f} \pm 0.53$	$54.33^{c} \pm 2.53$
5% flaxseed (G6)	$103.87^{c} \pm 5.080$	$33.8^{e} \pm 0.721$	$49.0^{d} \pm 1.00$
5 % Mixture of flaxseed, sesame(G7)	$91.8^{d} \pm 2.623$	$38.2^{d} \pm 0.529$	$59.0^{b} \pm 1.02$
L.S.D (P≤0.05)	**5.26**	**0.817**	**2.99**

Each value is represented as mean ± standard deviation

Mean under the same column bearing different superscript letters are different significantly ($P \leq 0.05$).

Data offered in Table (6) illustrate the effect of sesame, and flaxseed on the renal biomarkers. The control (+) control group had significantly higher mean kidney functions (uric acid, urea, and creatinine) than the control (–) group ($P \leq 0.05$). All osteoporotic rats fed on different diets revealed significant decreases in mean values as compared to the control (+) group. The best treatment of the kidney functions (uric acid, urea, and creatinine) was recorded for group 7 (5% mixture powder, when compared to control the positive group). These findings are consistent with those of **El-Sayed *et al.* (2014),** who discovered that a diet rich in flax seed and sesame seeds substantially decreased plasma concentrations of renal function markers, such as, urea, uric acid, and creatinine in hypertensive rats. **Barakat and Mahmoud (2011)** found that giving rats a diet high in cholesterol caused a significant rise in serum urea.

Table (6): Effect of sesame and flaxseed on kidney functions of osteoporotic rats.

Treatment/Parameter	Creatinine (mg/dl)	Urea (mg/dl)	Uric acid (mg/dl)
Control –ve (G1)	0.46 ^{e} ±0.026	36.8 ^{f} ±2.252	2.80 ^{g}±0.025
Control +ve (G2)	1.76 ^{a} ±0.022	84.06 ^{a} ±1.272	8.65 ^{a} ±0.026
2.5% sesame (G3)	1.72 ^{a} ±0.021	77.75 ^{b} ±.026	8.6 ^{b} ±.024
5% sesame (G4)	1.15 ^{b} ±0.321	72.73 ^{c} ±.208	8.05 ^{c}±0.0365
2.5% flaxseed (G5)	0.96 ^{c} ±.025	66.10 ^{d}±1.028	7.57 ^{d}±0.0201
5% flaxseed (G6)	0.92 ^{cd} ±.0213	62.92 ^{e} ±2.52	6.98^{e}±0.0265
5 % Mixture of flaxseed, sesame (G7)	0.89 ^{d} ±.010	59.68 ^{f}±2.818	5.27^{f}±0.0265
L.S.D (P≤ 0.05)	**0.044**	**2.20**	**0.032**

Each value is represented as mean ± standard deviation .

Mean under the same column bearing different superscript letters are different significantly ($P \leq 0.05$).

Conclusion

The results of this research indicate that sesame and flax seeds may offer a significant degree of protection against osteoporosis in women who develop the condition after menopause. This is accomplished by the enhanced calcium and phosphorus that result from treating osteoporosis. Due to the combination that included the highest concentrations of estrogen hormone, which prevents osteoporosis and increases bone mineral density, it not only increased bone mineral density but also improved renal functions, cholesterol levels, and triglyceride levels.

Recommendations

the current study recommends studying the effect of flax seed and sesame powder on the other diseases because it is rich in antioxidants such as lignans, sesamin, sesamolin, and sesamol and The essential elements calcium, iron, manganese and phosphorus. Also. More interested in flax seed and sesame to make nutritional education programs to explain the risk of osteoporosis

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المجلـة العلمــية للتربيــة النوعيــة والعلوم التطبيقـية

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التأثير الوقائي للسمسم وبذور الكتان على هشاشة العظام المستحث بالبريدنيزون

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هشاشة العظام هي المرض الأكثر شيوعًا بين النساء في سن أنقطاع فترة الطمث ونظرًا لانخفاض كثافة المعادن بالعظام مع تقدم العمر، فإن هشاشة العظام تؤثر بشكل أساسي على النساء بعد ١٠ـ١٥ سنة من انقطاع الطمث. ان الغرض من هذه الدراسة هو معرفة كيفية تأثير مسحوق السمسم وبذور الكتان على الفئران المصابة بهشاشة العظام في هذه الدراسة، تم تقسيم خمسة وثلاثون فأر من الاناث البالغة أوزانهم ١٥٠ ± ٥ جم إلى سبع مجموعات كل منها تحتوي على خمسة فئران. الأولى مجموعة ضابطة سالبة، بينما تم الحقن للستة مجاميع الآخرى بمادة بريدنيزون بمعدل ٤,٥ ملجم لكل كجم (على مدار أسبوعين) للحث على هشاشة العظام وتقسمهم كالتالي المجموعة الثانية كمجموعة ضابطة موجبة. اما مجاميع المعالجة (المجموعة الثالثة تغذت على السمسم ٢,٥٪، المجموعة الرابعة تغذت على السمسم٥٪، المجموعة الخامسة تغذت على بذر الكتان ٢,٥٪ والمجموعة السادسة تغذت على بذر الكتان ٥ ٪ من بينما تغذت المجموعة السابعة علي ٥ ٪ من خليط السمسم وبذر الكتان وفى نهاية التجربة تم تصويم الفئران طوال الليل قبل الذبح. ، وتم تجميع عينات الدم وطردة مركزيا لفصل المصل. لتقدير كلا من الكوليسترول، الدهون الثلاثية ، HDL، LDL، VLDL ، ووظائف الكلى ، وإجراء مسح للفخذ الايمن ؛ و قياس معادن العظام (الكالسيوم والفوسفور) في الجسم. أظهرت النتائج المتحصل عليها أن المجموعات المعالجة بخليط بذور الكتان والسمسم ٥٪ أدت إلى إنخفاض المعنوية في الكوليسترول والدهون الثلاثية، LDL-c وVLDL-c وحمض البوليك واليوريا والكرياتينين و زيادة كثافة المعادن بالعظام و BMC و زيادة الكالسيوم والفوسفور.

الكلمات المفتاحية: كثافة العظام، الفئران ، السمسم ، بذر الكتان- التحاليل الكيميائية الحيوية.