REVIEW ARTICLE

The Metabolic Effect of Walnut in Polycystic Ovarian Syndrome

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ABSTRACT

Background: Herbal therapy play a documented role now in preventing and preventing different diseases and may alternate medicinal treatment. The aim of the study was evaluation the high dose of walnut ingestion on metabolic syndrome in the polycystic ovarian patient as lipid profile, fasting blood sugar, and insulin in comparison with metformin. Conclusion: treatment with high dose walnuts have a beneficial effect on oxidative stress, not by scavenging free radicals generation only, but also by protecting antioxidant status, that leading to decrease oxidative damage to lipids, so it serves in improving metabolic disturbances and to decrease the side effects of chemical treatment of PCOs.

Keywords: FBS, Lipid profile, Metabolic, Polycystic ovary, Walnuts.

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INTRODUCTION

One of the commonest endocrine problems of ladies in reproductive age is Polycystic ovary syndrome (PCOS).[1] PCOS, this complex state is distinguished by elevation androgen, period abnormalities, and about 6–8% of ladies may develop small cysts on their ovaries.[2] The sign and symptoms associated with the increased level of serum androgen are hair overgrowth all over the body, acne disturbance of lipid profile, insulin resistance, overweight, malignancy, and infertility.[3] In case of presenting two of the three of the following features so doctors can diagnose PCOS and this according to "Rotterdam features":

- Clinical or biochemical hyperandrogenism.
- Oligo- or amenorrhea.
- Presence of PCO by ultrasound.[4]

The manifestation of insulin resistance often describes PCOS with hyperinsulinemia, and most of the patients in clinical series are overweight.[5] These criteria may have a crucial task in the pathogenesis of androgen elevation and the probability of progress earlier than conventional glucose intolerance condition and type 2 diabetes (T2D).[6] Metabolic disturbances are the main important features for the diagnosis of PCO syndrome, up to 70% of ladies who have PCO develop dyslipidemia.[7] The familiar features in women having PCO are elevation in TG serum level and decrease.[8] In women with PCOS, there is an increased in low-density lipoprotein cholesterol (LDL-C); however, women with PCO have been reported to have modifications in quality of LDL and decreased the mean LDL particle size.[9] Metformin, a class of insulin sensitizers, is most commonly used in the treatment of type 2 Diabetes mellitus (DM), While lowering the blood glucose level, metformin can cause reduction of fat mass and inhibition of tumor cell proliferation.[10] Metformin act by inhibition gluconeogenesis so this will lead to reducing production of glucose in the liver in addition to enhanced consumption of glucose in peripheral tissue like muscle, liver, and intestine.[11] Pre-prandial metformin using significantly decrease plasma TG level during testing of the meal, which proposes that a simple modification in the scheduling of metformin administration represents a right way for acceleration triglyceride-lowering approaches in patients with DM type 2 and postprandial hypertriglyceridemia.[12] Walnuts, in particular, have a special profile: Walnut consist linoleic, oleic acid, α-linolenic acid and palmitoleic acid (64%), (13.3%), (8.5%) (0.2%) respectively also it consists some saturated fatty acids as palmitic acid and stearic acid and they are rich in polyunsaturated fatty acids, high-walnut-enriched diets significantly decrease total and LDL cholesterol for the trials with the short-term duration. Large dose and longer period studies are wanted to report the effects of walnut on cardiovascular risk and body weight.[13] Now, it is well proved that nuts can ameliorate lipid profile n blood and decrease the danger of cardio arteriolar diseases.[14] Nuts having a favorable fatty acid also are a good basis of bioactive composites (L-arginine) the source of AA of the nitric oxide(NO),[15] antioxidants, phytochemicals, folic acid,

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and fibers. It has been shown that nut ingestion of up than four-five quotas/week significantly reduces risk of CAD.[16] Monounsaturated fatty acids is major component of Nuts while walnut is composed high amounts of polyunsaturated fatty acids.[17]

SUBJECTS AND METHOD

The study was done in Hilla Provence involving women attended Babylon hospital of gynecology and pediatrics; those women were diagnosis by the gynecologist as PCO and according to Rotterdam criteria. In this trial, 60 women with polycystic ovarian syndrome enrolled, and we excluded (pregnant, chronic disease, Alcoholism, chronic smokers, and there is no treatment used by those women that may cooperate with the measured parameters for a time prior the trial. Unwritten agreement was full from all patients who contribute to this trial after they were expressed about the benefit of the study. Furthermore, full information was taken from each lady regarding their age , weight, address history of the sign and symptom of disease and medication,[15] out of 60 of the cases did not complete treatment, the remaining 45 enrolled in this study. And according to the type of treatment the enrolled cases were separated into two groups:

Metformin treated group,[22] women treated with 500mg metformin three times daily for 90 day; walnut treated group:[23] women received 150 gm walnut once daily (in morning) for 90 days.

From all cases and with sterile syringe 10 mL of blood were collected, putting the blood in non-heparinized tubes and then resting the tube for 15 minutes at room temperatures after that the tubes were centrifuged for collecting serum in Eppendrof tubes kept at (–20^{o}c).

Lipid profile

Total serum cholesterol conferring to (Allan and Dawson, 1979), serum HDL measured according to (Lopies- Virella, 1977) and serum triglyceride were measured according to (Tietz *et al*., 1999) all three measured by using reagents equipped by BIOLABO SA., while LDL and VLDL were measured (Friedwald, *et al*., 1972).

Insulin in serum

Principle of the assay

The AIA PACK test was used for the quantitative measurement of insulin (IRI) in which the insulin concentration in the test is directly proportional to the level of an enzyme-labeled monoclonal antibody, which is bounded on the beads. That results in the construction of a standard curve, and an unknown amount of concentration as a sample is calculated.

Analysis of data

Statistical analysis was carried out by using SPSS version 18. Variables were presented as (Means ± SD) and one way ANOVA used to compare two means of the same group for normally distributed data and between the groups was used A p-value of ≤0.05 was considered as significant.

RESULTS

Fasting Blood Sugar and Serum Insulin

The walnut treated group significantly increased fasting blood sugar 3.9 ± 0.30-5.3 ± 0.51, the difference was not significant ($P \leq 0.05$) when compared with metformin-treated group 4.61 ± 0.46-3.4 ± 0.61. Fasting serum insulin did not change significantly ($P \geq 0.05$) after treatment with the walnut 16.23 ± 4.06-17.46 ± 3.68 but significant differences when compared with serum insulin 27.36 ± 13.06-20.22 ± 14.32 ($P \leq 0.05$) in metformin-treated group Table (1, 2).

Lipid Profile

After treatment with walnut, total cholesterol, and LDL cholesterol reduced significantly from (5.74 ± 0.4 - 4.30 ± 0.62 and 3.52 ± 0.33 –2.05 ± 0.54 respectively) with significant changes in total cholesterol in a metformin-treated group with significant changes in LDL cholesterol as shown in Tables 3 and 4.

However, the improvement did not reach statistical significance when compared Walnut with a metformin-treated group ($p \geq 0.05$).

Serum HDL cholesterol did not increase significantly after treatment with walnut and metformin (1.18 ± 0.13–1.83 ± 0.23) (1.48 ± 0.63–1.70 ± 0.31). In contrast, triglyceride cholesterol decreased considerably in the walnut group with no significant changes in the metformin-treated group as in Tables 3 and 4.

DISCUSSION

In this study, following three months of treatment, there

Table 1: Fasting blood sugar and serum insulin in walnut treated group

Parameter	*Pretreatment*	*Post-treatment*
FBS	3.9 ± 0.30	5.3 ± 0.51*
insulin	16.23 ± 4.06	17.46 ± 3.68

*significant difference(p ≤0.05)

Table 2: Fasting blood sugar and serum insulin in metformin-treated group

parameter	*Pretreatment*	*Post-treatment*
FBS	4.61 ± 0.46	3.4 ± 0.61*
insulin	27.36 ± 13.06	20.22 ± 14.32*

*significant difference(p ≤0.05)

Table 3: Lipid profile changes in walnut treated group

Parameter	*Pretreatment*	*Post-treatment*
cholesterol	5.74 ± 0.4	4.30 ± 0.62*
HDL	1.18 ± 0.13	1.83 ± 0.23
LDL	3.52 ± 0.33	2.05 ± 0.54 *
TG	1.74 ± 0.71	0.82 ± 0.23*

*significant difference(p ≤0.05)

Table 4: The effect of metformin on lipid profile

Parameter	*Pretreatment*	*Post-treatment*
cholesterol	4.23 ± 0.36	3.73 ± 0.40*
HDL	1.48 ± 0.63	1.70 ± 0.31
LDL	2.49 ± 0.61	2.11 ± 0.58 *
TG	1.39 ± 0.26	0.88 ± 0.30

*significant difference (p ≤0.05)

were a significant reduction in the total serum cholesterol and LDL. The polyunsaturated fatty acid, which is one of the main composition of walnut oil, the presence of this fatty acid in the LDL constitution, facilitated the clearance of LDL by hepatocytes receptor-mediated process, which may describe the effects of walnut feeding on lowering cholesterol level.[21]

Some studies have shown that the adding of walnuts to the nutrition of the patients with high level if serum cholesterol and patients normal serum lipid will improvements in total and LDL cholesterol[22] and[26] also agree with results of our study on lipid profile but other trials[23,24] did not detect significant decreases in total cholesterol and LDL cholesterol after using of walnuts. Serum triglyceride levels were significantly reduced after the study. This is reliable with two previous studies[29] and in contrast with some others[30] A trial by Sabate *et al.*[31] has disclosed that there is decrease of serum TGafter one month of feeding with walnut , but not to a significant degree so it may decrease significantly for more than 4 weeks. (Vit. E) a lipophilic antioxidant present in walnut acts as 1st line of defense against lipid peroxidation.[28] In this trial, there was insignificant difference in the serum HDL levels in the walnut group. A meta-analysis of many studied did not show any correlation between walnut ingestion and serum HDL levels.[32] hypercholesterolemia leads to an increase of cholesterol leaks that modify the physical features of the cell membrane and may facilitate the get out of the reactive oxygen species from the mitochondrial electron system or the activation of NADPH oxidase.[18] The formation of reactive free radicals causes lipid peroxidation in the cell membrane generating lipid peroxide radicals.[19] Walnuts reduce oxidative stress by scavenging free radicals also by protecting antioxidant status also, thus leading to decrease oxidative damage to lipids and proteins.[20]

The utilization of walnut will increase the level of fasting serum sugar in a significant way, while it's did not significantly affect fasting serum insulin.

These results properly agree with those from previous clinical studies on diabetic persons.[25] Review by[26] agrees with our result in increasing FBS and not affect insulin significantly, but it increases serum glucose.

Other trials have found that there is an insignificant correlation between walnut ingestion and level of FBG or glucose tolerance,[33,34] while Tapsell *et al.* have presented that long-term walnut feeding could significantly decrease the fasting blood sugar and the level of insulin.[35]

A study by[27] showed that the administration of metformin might assist in improving glucose and lipid metabolism, and this result agrees with our results. Frequent nut feeding may play a role in minimizing the risk of T2DM and CVD through improvement in glucose and lipid metabolism and weight conservation. The defensive action of nuts may be due to their well-known nutrient features as well as non-nutrient bioactive substances. However, the exact mechanisms explained by these effects are not understood, and more selected research should be done in order to show the biological mechanisms.[36] All results in this study in a metformin-treated group is resembled to a thesis by Hayder,[37] which found a correlation between metformin and metabolic effect in women with PCO.

CONCLUSION

We found that increasing the dose of walnut consumption in PCOS woman for 3 month, significantly reduced:

- Total serum cholesterol
- LDL
- TG

Also, there was no significant difference between walnut and metformin on the metabolic disorder in PCO patients. Finally, walnut may act as a natural therapy in PCOS.

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