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Effect of low caloric diet supplemented by fennel *(Foeniculum vulgare)* seeds or black cumin *(Nigella sativa)* seeds and its mixture on obese adult female patients

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ABSTRACT

The present work was carried out to study the effect of low caloric diet supplemented with fennel seeds or black cumin seeds and their mixture on obese adult females. The control group (G1) used low caloric diet with 1000 kcal without supplementation, while groups (2 and 3) used low caloric diet supplemented with 5 g black cumin and 5g fennel seeds seeds, respectively. On the other hand, group (4) used low caloric diet supplemented a mixture of 2.5 g fennel seeds and 2.5g black cumin seeds. All supplementation were mixed with a cup of light yoghurt in dinner meal. The study was performed for 4 weeks. Anthropometric measurements and levels of serum triglyceride, cholesterol, LDL and HDL were taken pre and post the study. Females taken low caloric diet supplemented with black cumin (G2) or mixture of black cumin and fennel (G4) recorded significant decrease in their BMI when compared to the control group. Cases supplemented with Fennel (G3) recorded insignificant decrease in their BMI. The total cholesterol decreased significantly in groups (2 and 4), while it was decreased insignificantly in group (3) compared to the control group. HDL levels increased significantly in groups (2 & 4) compared to group (1).

Results of the present study indicated that significant decrease were in total body weight, BMI, WC, AC, TSF and AMC in group (2) which received black cumin seeds, followed by group (4) which received mixture of black cumin seeds and fennel seeds, followed by group (3) which received fennel seeds compared to the control group.

Keywords: Fennel- Black cumin- low caloric diet- obesity, females.

INTRODUCTION

Obesity is defined as the condition of excessive fat accumulation to such an extent that affects persons health (Polikandrioti and Stevanou, 2009). It represents one of the major nutritional health problems in different countries of the world and it is a major risk factor for the development of various pathological conditions including insulin resistance, diabetes, cardiovascular diseases, and non-alcoholic fatty liver disease. Also, it is associated with chronic low-grade inflammation in many tissues including adipose, liver, muscle, kidney, pancreas and brain (Heping *et al*., 2020).

Prescription of low caloric diets by reduction of 500–1000 kcal/day from usual intake will lead to a weight loss of approximately 0.5–1 kg/week (Gonzalez-Campoy *et al.*, 2013). Low caloric diets usually begining at 1000–1200 kcal/day, with diets below 1000 kcal/day sufficient in older, smaller and inactive individuals.

Fennel seeds (*Foeniculum vulgare*) contain carbohydrates, alkaloids, Phytosterols, phenols, tannins and flavonoids, much of dietary fiber, protein, calcium, iron, magnesium and manganese. Pharmacologically, it possess antioxidant, anti-inflammatory, antispasmodic, diuretic, antihypertensive, antimicrobial, Gastro protective, estrogenic, Hepatoprotective and antithrombotic activities (Shahid, 2018). Fennel seeds were used to investigate the possible interaction between a conventional drug used for management of cholesterol and traditional herbal remedies on the obesity (Nawal *et al.*, 2019).

Black cumin (*Nigella sativa*) and its active component thymoquinone have been shown to have positive effects in controlling glucose levels and lipid profiles in diabetics (Heshmati and Namazi, 2015).

Bariatric surgery for obesity is associated with a greater risk of complications, also medications for obesity causes some of side effects and not recommended for children or adolescents (Kelly *et al.*, 2013), therefore the best treatment methods for obesity are natural methods that depend on diets. It is also possible to support some natural plants to give better results and in a safe manner on public health without side effects.

The aim of the present study is to investigate the effect of low caloric diet supplemented by fennel *(Foeniculum vulgare)* seeds or black cumin *(Nigella sativa)* seeds or their mixture on obese adult female patients

MATERIALS AND METHODS

This study was carried out on a hundred obese adult females from nutrition clinic in Badr Helwan University Hospital. They are free from other concomitant diseases, and their BMI is greater than 30 kg/m^2 , age (20-40) years. The period of the study was 4 weeks. The patients were divided into 4 groups as following: Group (1) received low calories diet about 1000 Kcal (Controlgroup). Group (2) received low calories diet plus 5 g /day black cumin seeds. Group (3) received low calories diet plus 5 g /day fennel seeds. The fourth group received low calories diet plus 5 g /day mixture (Fennel 2.5 g and black cumin 2.5 g) seeds.

Fennel and black cumin seeds were purchased from agriculture research center Giza and were blended to be powder.

Anthropometric measurements: These were taken weekly and include height, total body weight - body mass index (BMI) - Waist circumference (WC), Mid-upper arm circumference and Triceps skinfold thickness.

Height : It was measured to the nearest 0.5 cm by using a vertical metric rule.

Total body weight: It was measured to the nearest 1 kg using a balance. Female removed her shoes, heavy clothes and objects before weighing.

Body mass index (BMI): It was calculated according to the following formula:
BMI = Body Weight (kg) / (height (m)^2 **(**Dudek, 2001).

Table (1): Classification of BMI (Nazma *et al.*, 2017).

Category	BMI (kg/m2)
Under weight	<18.5
Healthy weight	18.5–24.9
Pre obese state	25.0–29.9
Obese grade I	30.0–34.9
Obese grade II	35.0–39.9
Obese grade III	≥40

WC-mid is a better measurement to define central obesity than WC-IC, particularly in women WC-mid is a better measurement to define central obesity than WC-IC, particularly in women

Waist circumference (WC): WC-mid was measured in the horizontal plane midway between lowest rib and the iliac crest. Both WC-IC and WC-mid were measured to the nearest 0.1 cm at the end of a normal expiration by using non-stretchable tape measure. Before recording the measurement, the nurse would ensure that the tape was snug but did not compress the skin and was parallel to the floor. Standard = 80- 88 cm for woman and 94-102 cm for men (Nhlbi, 1998).

Med-upper Arm circumference (MUAC): Objective to assess the use of (MUAC) for identification of overweight, place a non-stretchable tape, preferably an insertion tap for easy reading, at the midpoint of the cases non-dominant arm between the top of the scapula and the olecranon process of the ulna with the forearm flexed at 90°. With the arm in the dependent position, gently and firmly draw the tap around the mid upper arm; do not compress the soft tissue. Record the reading to the nearest centimeters.
90% standard = 25.7 cm for women, 26.3 cm for men (Dudek, 2001).

Triceps skinfold thickness (TSF): Measured from triceps area by using caliper device, while the case arm was hanging freely, grasp a fold of skin and subcutaneous fat between the thumb and forefinger slightly above the midpoint mark. Gently pull the skin away from the underlying muscle, apply the calipers, wait 2 to 3 seconds, and read the measurements to the nearest 1.0 mm. Repeat the procedure 2 times more; add the three reading, and record their average.
90% standard = 11.3 mm for men , 14.9 mm for woman (Abd-elkader, 2001; Dudek, 2001).

Arm muscle circumference (AMC): It was calculated from MUAC and TSFT measurements, provides an index of muscle mass. It is calculated in centimeters as following equation:
AMC (cm) = MUAC (cm) - (3.14 × TSFT cm) *(*Abd-elkader, 2001)
90 % standard = 22.8 cm in men , 20.9 cm in woman. (Dudek, 2001)
Laboratory analysis: Serum lipids Triglyceride, total cholesterol, low density lipoprotein (LDL) and High density lipoprotein (HDL) were measured as recommended by Wendy *et al.* **(2005)**. Hemoglobin level also was measured. All measurements have been taken at the beginning and the end of the study.

Statistical Analysis: These were carried out using ANOVA test.

The low-calorie diet: It was designed around 1000 kcal according to food exchange list of American dietetic association (ADA, 2008).

Nutrition supplementation: Black cumin seeds and fennel seeds were grounded into a powder. Five grams of each of them were added to a cup of light yoghurt (110 g) in the dinner meal. Mixture of fennel seeds 2.5 g and black cumin seeds 2.5 g were grounded into a powder and were added to 1 cup of light yoghurt (110 gm) in the dinner meal.

RESULTS AND DISCUSSION

The results in Table (2) revealed that the mean daily calories intake pre dietary intervention were (2123±152, 2086±166, 2116±138 & 2096±190 k.cal/day) for groups (1, 2, 3 & 4), respectively. While, the mean daily calories intake post dietary intervention were 1013±62, 1013±62, 1036±54 & 1023±42 k.cal /day for groups (1, 2, 3 & 4), respectively. It was obvious that after dietary intervention for weight loss, calories intake/ day decreased by percentage (53.3%) in group (1), followed by (51.4, 52.1 & 51.4 %) for groups (2, 3 & 4) respectively. This decreased approved with (DRIs) recommendation which recommended that less amount of crobydrate, protein and fats intake/day for adult woman (19-50 years old) were (130 , 46 and 30 g/day, respectively.

Table (2): Daily calories intake (pre & post) study for obese adult female patients

Measuring parameter	Treatment	Group 1	Group 2 (black cumin)	Group 3 (fennel)	Group 4 (mix)
Calories (k.cal)	Pre invention	2123±152	2086±166	2116±138	2096±190
	Post invention	1013±62	1032±34	1036±54	1023±42
	Decrease %*	53.3	51.4	52.1	51.4

*decrease % = Calories (k.cal) in pre- intervention - Calories (k.cal) in post-intervention

It was clear from data in Table (3) that the percentage of carbohydrates intake pre dietary intervention was (261%) in group (1), followed by (263, 270 & 268 %) in groups (2, 3 & 4) respectively. This high amount of carbohydrate intake plays an essential role in developing of obesity (James, 2008; Branca *et al*., 2007). After dietary intervention carbohydrate intake was (95%) in group (1), followed by (96, 94 & 95 %) in groups (2, 3 & 4), respectively. This amount is approved with (DRIs) recommendation and help patients for loss weight without side effect. This result agreed with Feinman *et al*. (2015), McArdle *et al*. (2016), Hooper *et al*. (2015) and Noto *et al*. (2013) who reported that the amount of carbohydrate in low caloric diet is less than 130 g/day.

Table (3): Daily macronutrients and fibers intake (pre & post) study for obese adult female patients compared to DRIs.

Measuring parameter	Treatment	Group 1	Group 2 (black cumin)	Group 3 (fennel)	Group 4 (mix)
Carbohydrate (g)	DRI	130	130	130	130
	Pre invention	319±27	322±23	331±19	328±24
	Post invention	124±3.9	125±4.3	123±5.1	124±5.2
	Pre invention %	261	263	270	268
	Post invention %	95	96	94	95
Protein (g)	DRI	46	46	46	46
	Pre invention	81±7.4	79±6.8	80±8.2	82±6.3
	Post invention	57±3.7	55±4.2	56±3.2	58±5.1
	Pre invention %	176	171	174	178
	Post invention %	123.9	119.5	121.7	126.0
Fat (g)	DRI	30	30	30	30
	Pre invention	59±2.3	61±3.4	60±1.9	59±2.6
	Post invention	29±3.6	30±4.2	31±5.2	29±3.4
	Pre invention %	168	174	171	170
	Post invention %	96	100	103	97
Fibers (g)	DRI	25	25	25	25
	Pre invention	19.2±2.8	18.3±1.9	17.2±3.1	18.4±2.4
	Post invention	26.2±1.1	26.5±1.4	25.3±.89	26.1±1.6
	Pre invention %	76.8	73.2	68.8	73.6
	Post invention %	104.8	106	101	104.4

With regard of protein intake pre intervention, the results showed that percentage of protein intake was (176 %) in group (1), followed by (171, 174 & 178 %) for groups (2, 3 & 4), respectively. Protein intake post dietary intervention for groups (1, 2, 3 & 4) was (123.9, 119.5, 121.7 & 126 %), respectively. Protein intake has been reduced, as part of the general reduction in calories; however the rates were higher than DRIs recommendations. Other studies indicated that high-protein diets produce greater short-term mean weight loss as compared to standard-protein diets (Wycherley *et al*., 2012; Santesso *et al*., 2012; Clifton, 2012).

In case of fat intake percentage pre dietary intervention, results showed that fat intake was (168%) in group (1), followed by (174, 171 &170 %) for groups (2, 3 & 4), respectively, the excess consumption of fat leads to its accumulation and storage in adipose tissue which causes obesity. This results agreed with Coelho *et al*. (2011) who found that dietary fat composition can lead to development of obesity due to the specific roles of some fatty acids that have different metabolic activities, which can alter both fat oxidation and deposition rates, resulting in changes in body weight and/or composition. After dietary intervention fat intake was (96 %) in group (1) compared to DRIs, followed by (100, 103 & 97 %) for groups (2, 3 & 4), respectively.

Fibers intake by group (1) was 76.8 % from DRIs requires pre intervention, followed by (73.2, 68.8 & 73.6) for groups (2, 3 & 4), respectively. While, post intervention group (1) intake was (104.8 %) of fibers, followed by (106, 101 & 104.4 %) for groups (2, 3 & 4) respectively as compared with DRIs requirements of fbers. The decrease in consumption of fiber pre dietary intervention reflex one of obesity reasons in the cases because of the importance of fibers in maintaining health body weight according to its role in decreasing levels of blood sugars and lipid, in addition to helping body in waste secretion and play a role in energy metabolism. Semih and selin (2014) reported that increasing the intake of high fiber foods or fiber supplements improves serum lipoprotein levels, lowers blood pressure, improves blood glucose levels for diabetic individuals and aids weight loss.

Data n Table (4) indicated that the percentage of iron intake pre intervention was (63.3, 57.2, 60 and 62.2 %) for groups (1, 2, 3 and 4), respectively, while their respective post dietary intervention was (91.1, 88.3, 91.6 and 89.4). The percentage of calcium intake pre intervention was 122.4, 136.2, 119.3 and 121.4 %) for groups (1, 2, 3 and 4), respectively, while their respective post interventions was 85.4, 92.1, 91.3 and 91.5 %. The percentage of phosphorus daily intake pre intervention was 112.7, 113.1, 120.1 and 111.1 % in groups (1, 2, 3 and 4), respectively, while it was 108, 110.2, 111.7 and 113.1% in post intervention.

Table (4). Minerals mean intake for obese adult female patients as compared to DRIs.

Measuring parameter	Treatment	Group 1 (control)	Group 2 (black cumin)	Group 3 (fennel)	Group 4 (mix)
Iron (g)	DRI	18	18	18	18
	Pre invention	11.4±2.3	10.3±1.9	10.8±1.8	11.2±1.6
	Post invention	16.4±2.3	15.9±3.5	16.5±3.8	16.1±2.8
	Pre invention %	63.3	57.2	60.0	62.2
	Post invention %	91.1	88.3	91.6	89.4
Calcium (g)	DRI	1000	1000	1000	1000
	Pre invention	1224±174	1362±69	1193±135	1214±166
	Post invention	954±35	921±52	913±42	915±37
	Pre invention %	122.4	136.2	119.3	121.4
	Post invention %	95.4	92.1	91.3	91.5
Phosphors (g)	DRI	700	700	700	700
	Pre invention	789±79	792±92	841±85	778±76
	Post invention	756±36	772±41	782±23	792±47
	Pre invention %	112.7	113.1	120.1	111.1
	Post invention %	108.0	110.2	111.7	113.1

Results in Table (5) revealed that the mean height of obesity patients was 162.3±8.5 (cm) in group (1), followed by (163.1±7.6, 162.3±6.5&161.7±7.5 cm) in groups (2, 3 & 4), respectively. Related to body weight decrease percentage, the results revealed that group (1) received low caloric diet without supplementation recorded (5.7±1.23 %) decreasing in body weight. This results agreed with Gonzalez-Campoy *et al*. (2013) who reported that prescription of low caloric diets containing reduction of 500–1000 kcal/day from usual intake will provide a weight loss of approximately 0.5–1 kg/week. The percentage of body weight loss increased to (7.9±1.72, 6.4±1.59&7.2±1.26 %) in groups (2, 3 & 4), respectively. It was observed that black cumin seeds increased percentage of body weight loss in group (2), more than group (4) which received mix from fennel and black cumin seeds, more than group (3) which received fennel seeds.

Table (5). Anthropometric measurements for obese adult female patients after one month of dairy intervention.

Measuring parameter	Treatment	Group 1 control	Group 2 Black cumin	Group 3 Fennel	Group 4 mix
Height (cm)		162.3±8.5	163.1±7.6	162.3±6.5	161.7±7.5
Weight (kg)	Pre invention	90.8±6.4	89.2±5.6	88.5±5.5	90.3±6.2
	Post invention	85.6 ±6.1	82.1±5.4	82.8±6.1	83.8±5.8
	↓ %	5.7±1.23^{c}	7.9±1.72^{a}	6.4±1.39^{b}	7.2±1.26^{ab}
BMI	Pre invention	34.2±2.4	33.5±1.6	33.9±1.5	34.6±3.11
	Post invention	31.9±2.29	30.4±1.74	31.3±2.12	31.7±2.85
	↓ %	7.16±0.99^{bc}	8.65±1.20^{a}	7.65±.96^{b}	8.29±1.0^{ab}
WC (cm)	Pre invention	111±6.74	106±5.25	107±4.22	108±5.26
	Post invention	104±5.73	98±4.47	100±3.85	101±4.72
	↓ %	6.45±1.4^{b}	8.21±1.3^{a}	7.26±1.6^{ab}	7.64±1.0^{a}
AC (cm)	Pre invention	36.3±2.21	34.6±2.10	34.9±1.08	35.4±1.71
	Post invention	33.6±1.96	31.4±1.55	32.1±0.97	32.4±1.55
	↓ %	7.63±.8^{b}	9.24±1.3^{a}	8.12±.85^{ab}	8.61±.9^{a}
TSF (mm)	Pre invention	35.2±1.01	33.3±1.45	34.2±1.27	35.5±1.62
	Post invention	31.9±1.09	27.8±1.37	30.1±1.10	30.9±1.58
	↓ %	9.6±1.7^{c}	15.5 ±2.2^{a}	11.9±1.8^{b}	12.7±0.8^{b}
AMC (cm)	Pre invention	25.3±2.1	24.1±1.8	23.2±1.6	24.3±2.3
	Post invention	23.6±1.4	22.7±2.1	21.6±1.8	22.8±1.7
	↓ %	6.7±.72^{b}	5.8±.54^{a}	6.6±.43^{b}	6.2±.81^{b}

With regard of body mass index (BMI), results in Table (5) showed that its value in group (1) was (7.16±0.99, 8.65±1.20, 7.65±1.23 & 8.29±1.26 %) for groups (1, 2, 3 & 4), respectively. The significant decrease in BMI was (8.65±1.20 %) in cases of group (2) which supplemented with black cumin seeds compared to group (1). Also, low caloric diet supplemented with fennel seeds in group (3) leads to insignificantly decrease of BMI in obesity female patients compared to group (1). Meanwhile, group (4) recorded significant decrease.

The percentage decrease of Waist Circumference (WC) of groups (1) was (6.45±1.91 %). Group (2) recorded significantly percentage decrease of WC (8.21±1.30 %) when compared to group (1). On the other hand, insignificant WC percentage decrease (7.26±2.66 & 7.64±1.04 %) was recorded in groups (3

& 4), respectively when compared to group (1).

Results of Arm Circumference (AC) (Table 5) indicated that the percentage of decreasing values were (7.63±.8, 9.24±1.3, 8.12±.85 & 8.61±.9 %) for groups (1, 2, 3 & 4), respectively. The significant AC percentage decrease (9.24±1.3%) was in group (2) (black cumin) compared to group (1), followed by groups (4). This result indicates the effect of black cumin seeds and the mix seeds in reducing body weight.

As shown in Table (5), the decreasing percentage of TSF of group (1) was (9.6±1.7 %), while it was (15.5 ±2.2, 11.9±1.8&12.7±0.8 %) in groups (2, 3 & 4), respectively compared to group (1). This is evidence that the process of burning fat was done correctly by burning fat instead of losing muscle mass.

According to AMC, the percentage of decreasing value in group (1) was 6.7±.72%, while it was 5.8±.54% in group (2) compared to group (1). On the other hand this was 6.6±.43 & 6.2±.81% in groups (3 & 4), respectively (insignificant decrease) compared to group (1). This result indicated that the process of burning fat was done correctly by burning fat instead of losing muscle mass.

Previous results indicated that the best weight reduction including (weight, BMI, WC, AC, TSF and AMC) was in group (2) which received black cumin seeds, followed by group (4) which received mix from (black cumin seeds and fennel seeds), followed by group (3) which received fennel seeds, followed by group (1) without supplemented seeds. This explains that black cumin seeds and fennel seeds had weight reduction effect, while black cumin seeds had the best effect. These results agreed with Aftab *et al*. (2013) and Vanamala *et al*. (2012) who reported that *Nigella sativa* seeds and its active substance thymoquinone showed anti-obesity effect, positive effect against cardiovascular disease and insulin sensitivity effects. Also, Datau *et al*. (2010) found that when obese men were given three g/day black cumin seeds powder for 3 months, a significant decrease was observed in their body weight, and waist and hip circumference. Also, Fararh *et al*. (2010) demonstrated significant decreasing in body weight of diabetic rats treated with 300 mg/day black cumin extract for 30 days. On the other hand, Nawal *et al*. (2019) found that fennel causes weight reduction effect on obese male rats. Eman *et al*. (2011) reported that treatment hyperlipidemic rats with fennel enhanced their biochemical parameters.

Data in Table (6) showed that percentage of serum triglyceride was decreased in group (1) (12.11±0.9 %). This percentage increased significantly in group 2 to (17.05±1.4 %), followed by (15.12±1.3 & 16.10±2.1 %) in groups (3 & 4), respectively.

The highest percentage for cholesterol levels changes was 16.09±2.7 % in group (2), followed by. group (4) (14.92±2.4), group (3) (13.98±3.3) and group (1) (11.93±1.5).

LDL decreasing percentage was (12.12±1.2 %) in group (1), (16.05±1.9 %) in group (2), followed by (14.04±2.1 & 14.92±1.8 %) in groups (3 and 4), respectively. This indicates that best results had been obtained in group (2).

HDL percentage was (15.79±4.5, 13.89±3.0 & 14.71±2.9 %) in groups (2, 3 & 4), respectively, recorded significant increasing results compared to group (1) (10.25±2.1 %). The best result was obtained in group (2) which supplemented with black cumin.

According to this results low caloric diet play an important role in decreasing the excessive of blood lipids (cholesterol, triglyceride and LDL), while increased the percentage of HDL (good cholesterol). The supplementation with fennel seeds, black cumin seeds and its mixture with low caloric diet decreased cholesterol, triglyceride and LDL levels compared to supplemented group (1), while increased HDL level compared to group (1). These results agree with Gholam *et al*. (2019*)* who reported that the levels of TG, total cholesterol, LDL, ALT, and Alkaline phosphatase significantly reduced by treatment with fennel seeds extract and the level of HDL significantly increased. Previous study of Moeen-ud-din *et al*. (2014) showed that the intake of two teaspoons of black cumin seeds for six weeks by hyperlipidemic patients decreased their LDL-C and increased their HDL-C. Also, Mahdieh *et al.* (2018) reported that treatment with black cumin reduced body weight and body mass index (BMI). Serum concentrations of LDL and TG also decreased in black cumin treated group after 8 weeks, while serum HDL significantly increased after treatment with black cumin seeds.

Table (6). Effect of fennel, black cumin and its mixture on tri-glyceride, cholesterol, LDL and HDL levels of obese female patients.

Measuring parameter	Treatment	Group 1 control	Group 2 Black cumin	Group 3 Fennel	Group 4 mix
Tri-glyceride (mg/dl)	Pre intervention	198±14.63	191±12.92	194±12.90	206±18.90
	Post intervention	174±12.66	158±10.67	166±10.88	172±15.64
	↓ %	12.11±0.9^{c}	17.05±1.4^{a}	15.12±1.3^{b}	16.10±2.1^{ab}
Cholesterol (mg/dl)	Pre intervention	235±16.97	229±17.50	231±14.60	237±18.37
	Post intervention	207±16.25	192±16.56	201±24.96	203±17.38
	↓ %	11.93±2.5^{cb}	16.09±2.7^{a}	13.98±3.3^{b}	14.92±2.4^{ab}
LDL (mg/dl)	Pre intervention	173±7.92	169±8.37	169±7.62	179±8.31
	Post intervention	152±7.73	142±6.67	145±6.73	153±7.21
	↓ %	12.12±1.2^{b}	16.05±1.9^{a}	14.04±2.1^{a}	14.92±1.8^{a}
HDL (mg/dl)	Pre intervention	39±2.64	39±2.72	37±2.83	38±2.91
	Post intervention	43±3.22	45±2.12	42±2.84	45±3.09
	↑ %	10.25±2.1^{b}	15.79±2.5^{a}	13.89±2.0^{a}	14.71±2.9^{a}

The increase percentage of hemoglobin level in group (1) was (9.85±2.55 %), while it increased to (11.11±3.24, 9.92±2.70 & 10.16±4.64 %) in groups (2, 3 & 4), respectively. The increasing in hemoglobin levels in all groups may related to increasing iron intake post dietary intervention.

Table (7). Effect of fennel, black cumin and its mixture on Hemoglobin level of obese female patients.

Hemoglobin (g/dl)	Group 1 control	Group 2 Black cumin	Group 3 Fennel	Group 4 mix
Pre intervention	198±12.7±1.73 14.63	13.2±2.82	13.2±1.95	12.9±1.69
Post intervention	13.9±1.80	14.8±2.44	14.6±1.55	14.5±1.54
↑ %	9.85±1.55^{a}	11.11±1.24^{a}	9.92±1.70^{a}	10.16±1.64^{a}

Conclusion:

Low caloric diet help to reduce body mass index (BMI) and improve lipid profile, while low caloric diet supplemented with black cumin seeds decreasing significantly the rate of BMI as well as improving lipid profile while fennel seeds improved insignificantly lipid profile and decreasing BMI.

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Effect of low caloric diet supplemented by fennel *(Foeniculum vulgare)* seeds or black cumin *(Nigella sativa)* seeds and its mixture on obese adult female patients

تاثير النظام الغذائي قليل السعرات المدعم ببذور الشمر و بذورالكمون الاسود وخليطهما عليمريضات السمنة البالغات

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المستخلص

تم اجراء دراسة تاثير النظام الغذائي منخفض السعرات المدعم ببذور الشمر *Foeniculum vulgare* والكمون الاسود*Nigella sativa* وخليطهما علي مرضي السمنة الاناث البالغات, تم تقسيم الحالات الي اربع مجموعات حيث أتبعت المجموعة الاولي نظام غذائي منخفض السعرات بدون تدعيم بالبذور بينما المجموعة الثانية تناولت 5 جم من بذور الكمون الاسود مع النظام الغذائي منخفض السعرات والمجموعة الثالثة تناولت 5 جم من بذور الشمر بينما تتناولت المجموعة الرابعة 5 جم خليط من بذور الشمر والكمون الاسود. اظهرت نتائج الدراسة تحسن معنوى في انخفاض الوزن وتحسن مستويات دهون الدم في المجموعات 2 ، 4 بينما سجل تحسن غير معنوى فى المجموعة 3 مقارنة بالمجموعة الضابطة. وكانت النتيجة الافضل معنويا في المجموعة الثانية التي تناولت 5 جم من بذور الكمون الاسود تليها المجموعة الرابعة التي تناولت 5 جم من خليط البذور.

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