

The potential effects of lemon and cumin on weight reduction and blood sugar in obese and overweight patients

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Abstract

This study was undertaken to determine the effects of regimen diet with or without containing yogurt supplemented with lemon or cumin and mixture of them on body weight reduction, fasting blood glucose and glucated hemoglobin HbA_{1c} levels. A random sample of 100 patients (50 male and 50 female) with obesity or overweight, were selected from Kasr El-Aini Hospital out patients, with age from 30-45 years. Randomly patients were divided into 5 groups, each group includes 20 patients 10 male and 10 female. Body weight and blood samples were collected from all participants at baseline and after 12 weeks to determine BMI,

Samah, A.S. Abdel-Shafy , Seham A.M. Tharwat , Ashraf. A. Abdel-Meged , Randa salam and Rehab H. Gaballah

the fasting blood glucose and Hb A_{1c}. The first group kept on their usual diet and considered as control (+ve) group.

The second group treated only with regimen diet depend on BMI (1200 K.Cal(60gm protein ,40gm fat &150 carbohydrate) or 1500 K.Cal (75 gm protein,50gm fat & 187.5 carbohydrate)for overweight or obese patients) the third group treated with the same (RD) plus a dose of cumin in amount of 5g/d for 12 weeks. The fourth group received (RD) plus a dose of lemon 5g/ d. The fifth group received (RD) containing a dose of cumin 2.5g/d mixed with 2.5 g lemon/d (1:1w/w).

After 12 weeks of regimen dietary treatments, Results revealed that regimen diet (1200 or 1500 K.Cal/d) containing skim milk yogurt supplemented with cumin, lemon and mixture of them (1:1w/w) induced a high significant decrease in BMI, Fasting blood glucos and glycated hemoglobin HbA_{1c} levels as compared to at baseline and as compared to control which treated with only regimen diet. In conclusion, or results showed that regimen diet containing skim milk yogurt supplemented with a mixed of cumin plus lemon (1:1w/w) induced a high significant ($P<0.01$) decrease in BMI, fasting blood glucose and glycated hemoglobin in obese and over weight patients. Therefore mixed cumin and lemon (1:1w/w) may represent a potentially therapeutic effect on decreasing BMI in obese and overweight patients.

Introduction

Overweight and obesity are the fifth leading risk for global death. At least 2.8 million adults die each year as a result of being

overweight or obese. In addition, 44% of the diabetes burden, 23% of the ischemic heart disease and between 7 and 41% of certain concern burdens are attributable to overweight and obesity (*WHO, 2012*). In developing countries with emerging economics (Classified by the world Bank as lower and middle-income countries), the rate of increase of childhood, overweight and obesity has been more than 30% higher than that developed countries (*WHO, 2015*).

Obesity is the accumulation of an excess of energy stored in form of excess body fat. This excess results from the fact that the energy ingested from diet is superior to the energy expenditure such as physical activity, resulting in an energy balance dysregulation, which is due to complex and multifactorial aetiologies (*Heymsfield SB, Wadden TA, 2017*).

Even through there are several treatments, such as surgery and drugs, there seems to be no efficient treatment without potential side effects., thus considering a life style modification as the best option. In addition to a life style modification, natural after natives may provide increased health expectancy. Several plants possess anti-obesity potential (*Claudia et al., 2015*). Cumin, as one of medicinal plants, contains more than 100 different chemicals including essential fatty acid, and volatile oils (*Ardekani et al., 2011*). Some studies have shown that cumin may have decreasing effects of blood lipid and weight (*Andallu and Ravnya, 2007*). Citrus species fruits are considered to contain.

Samah, A.S. Abdel-Shafy , Seham A.M. Tharwat , Ashraf. A. Abdel-Meged , Randa salam and Rehab H. Gaballah

Flavonoid, pectin and vitamin C as lemon and sour orange are two citrus species Persian fruits, which are popularly used among Egyptian as natural additives to several foods and salads (*Mulvihill et al., 2009*).

Subjects and Methods

Subjects:

A random sample of 100 patients (50 male and 50 female) with overweight or obesity, were selected from Kasr El-Aini Hospital out patients with age from 30-45 years with a body mass index of $> 25 : < 30 \text{ kg/M}^2$ and of 30 kg/M^2 for overweight and obese men and women respectively, lack of any history diseases and special drug consumption. Table (1) shows the characteristics of experimental subjects.

Criteria for subjects selection:

No previous treatment regimens in the past three months and lack of weight change by more than 2Kg in the last months were included.

Exclusion criteria are as follows:

Having allergic reactions to cumin and failure to the prescribed diet.

Experimental Design:

The patients were randomly divided into 5 group-each group consists of 20 subjects with overweight or obese (10 male

and 10 female), mean age 30-45 y, regimen dietary treatment as the following.

Group (1): kept on their usual diet without regimen diet and served as a control positive group (+ve)

Group (2): received a regimen diet (RD) according to their BMI (<30 BMI consider lean and were fed on a regimen diet contain 1500 K.Cal/ d and > 30 BMI consider obese and were on regimen diet contain 1200 K.Cal/d).

Group (3): received the same (RD) as group (2) plus a dose of cumin in amount of 5g/d in 12 weeks.

Group (4): received the same (RD) plus a dose of 5g lemon/ d in 12 weeks.

Group (5): received the same (RD) plus a dose of 2.5g/d cumin mixed with a dose of 2.5g/d lemon (1:1 w/w).

Cumin and lemon incorporated in to skim milk yogurt product into their regimen diet for 6 days/week, 20 minutes before breakfast and lunch for 12 weeks.

The selected physical parameters such as dietary pattern and family history of obesity were assessed before and after intervention.

Baseline data were collected with the help of interview schedule and physical parameters were assessed by using standard measurement scales.

A- Anthropometric assessment:

Weight, height and body mass index calculated according to *Mitch and Klahr, (1993)*, as the weight (kg)/height (²M). The prevalence of overweight or obesity was determined.

Samah, A.S. Abdel-Shafy , Seham A.M. Tharwat , Ashraf. A. Abdel-Meged , Randa salam and Rehab H. Gaballah

B- Dietary Studies:

24 hours recall for 7 days before and after the intervention, food pattern and diet history were used. The energy and nutrients content of the 24 hour were computed through the food composition table of National institute (**Food composition tables for Egypt, 1996**).

C- Manufacture of Supplemented Yogurt Product:

Frisch skim milk was obtained from dietary science department, faculty of Agriculture, Cairo University, Egypt. Skim milk powder (Finland) was obtained from Master trade company, Egypt. Yogurt starter culture freeze dried starter culture (FD-DVS ye-X11) containing streptococcus termophilus and lactobacillus SSP bulgaricus was obtained from Che. Hansen Inc. Denemark, by Misr Food Additives (MIFDA). Egypt. Yogurt manufactured according to **Tamime and Robinson, (2007)**.

D- Biochemical Analysis of Serum:

Blood samples were collected from patients after 12 h over night fast at baseline and after 12 weeks of the start to determine the following parameters.

Determination of serum glucose according to **Trinder, (1959)**. Liver enzymes activities serum Aspartate amino transferase (AST) and Alanin amino transferase (ALT) were

determined enzymatic calorimetrically according to the method of *Henry et al., (1974)*.

Determination of Uric-acid in serum was determined according to *Henry et al., (1974)*. Determination of Serum Creatinine was determined according to the method described by *Bartels and Bohmer, (1971)*. Determination of serum HbA_{1c} according to *Trinder (1959)*.

Statistical analysis was carried out using SPSS statistical software version 11 (*SAS., 2004*).

Kits for biochemical analysis were obtained from Gamma trade co. for pharmaceutical and Chemicals. Dokki, Egypt.

Results and Discussion

Effect of Regimen Diet with or without supplemented yogurt with cumin or lemon on Body Mass index in overweight and obese patients:

Tables (2&3) shows the effect of regimen diet (RD) without or with supplemented yogurt with cumin or lemon and mixture of cumin plus lemon on body mass index (BMI) in male and female overweight or obese patients at baseline and after 12 weeks with treatments. Results revealed that the (+ve) group of patients kept on their usual diet (3200 + 100 k.cal/d) resulted in a highly significant increase ($P < 0.01$) in BMI as compared to at baseline. While other groups which treated with regimen diet (RD) (1200 or 1500 k.cal/d) for obese or overweight groups induced a significant decrease ($p < 0.05$) in BMI as compared to at baseline and as compared to the control (+ve) group without dietary treatment. On the other hand our results revealed that overweight and obese

Samah, A.S. Abdel-Shafy , Seham A.M. Tharwat , Ashraf. A. Abdel-Meged , Randa salam and Rehab H. Gaballah

groups which treated with (RD) (1200 or 1500 k.cal/d) containing yogurt supplemented with cumin or lemon for 12 weeks resulted in a highly significant ($P < 0.001$) decrease in BMI as compared to at baseline and as compared to control (+ve) treated with only regimen diet.

Concerning male and female over weight, and obese groups treated with regimen diet containing yogurt supplemented with mixture of cumin and lemon (1:1w/w) induced the best results highly significant decrease in BMI.

Concerning the effect of cumin on body weight reduction **Zara et al., (2014)** reported that cumin powder significantly reduced body weight, BMI, waist circumference, fat mass and its percentage in overweight and obese women. On the other hand **Taghizadeh et al., (2015)** also reported that taking *Cuminum L.* for eight weeks among overweight subjects had the same effects of orlistat 120 on weight and BMI, reduction. Cumin cymimum contain: alkaloi, anthraquinone, coumarin, flavonoid, glycoside, protein, resin, saponin, tannin and steroid (**Parthasarathy et al., 2008**).

Hajlaoui et al., (2010) cleared that the major compounds in cumin essential oil of Egyptian cultivars were cumin aldehyde, tetradecene α -terpenene, β -ocimene, P-metha-2-en-o1, α -terpinyl acetate, α -terpino line, lmonine, myrcen, β -pinene and α -pinene.

Concerning overweight and obese male and femal groups which treated with (RD) containing yogurt supplemented with

lemon induced a highly significant decrease ($p < 0.01$) in BMI. In this respect. **Ahmed et al., (2006)** reported that citrus are generally present in glycosylated forms citric acid present in lemon is an excellent fat burner. In this concern **Huong, (2006)** suggested that, naringenin increased hepatic fatty acid oxidation through up-regulation of the gene expression of enzymes involved in peroxisomal β -oxidation in mice. Citrus aurantifolia essential oil and ketotifen caused significant suppression in gaining weight as well as decreased body weights of mice the results suggested that citrus aurantifolia essential oil played an important role in weight loss. **(Asnaashari et al., 2010)**. Vitamin C is naturally present in lemon since vitamin C is an essential cofactor for the biosynthesis of carnitine, a molecule required for the oxidation of fatty acids **(Hoppel, 2003)**.

Huong, (2006) suggested that lemon polyphenols suppressed body weight gain and body fat accumulation by increasing the peroxisomal β -oxidation, which was likely mediated via up regulation of the mRNA levels of PPAR α in the liver. Our results revealed that mixture of cumin and lemon raise the effect of either component alone in weight reduction.

Effect of Regimen Diet with or Without Supplemented Yogurt with Cumin or Lemon on Fasting Blood Glucose in Overweight and Obese Patients:

Tables (4&5) illustrate the effect of different dietary treatment, kept on usual diet, only regimen diet, regimen diet containing yogurt supplemented with cumin or lemon and mixed cumin plus lemon (1:1 w/w) on fasting blood glucose in overweight

Samah, A.S. Abdel-Shafy , Seham A.M. Tharwat , Ashraf. A. Abdel-Meged , Randa salam and Rehab H. Gaballah

and obese male and female groups of patients at base line and after 12 weeks.

Our results revealed that control (+ve) of male and female kept on their usual diet (without dietary treatment) recorded a high significant increase in fasting blood glucose as compared to at baseline and as compared to (+ve) male and female groups treated with regimen diet (1200 or 1500 k.cal/d). On the other side groups on (RD) recorded a significant decrease ($P < 0.05$) in fasting blood glucose as compared to at baseline.

On the other hand our result revealed that male and female overweight and obese groups treated with (RD) containing yogurt supplemented with cumin, for 12 week induced a significant decrease ($P < 0.01$) in fasting blood glucose level as compared to at baseline and as compared to control group treated with only regimen diet., In this respect **Patil et al., (2013)** reported that cumin aldehyde and cuminol were identified as potent insulinotropic components, cumin aldehyde and cuminol (25 μ /ml) showed (3.34 and 3.25 fold increased insulin secretion respectively) cuminum able to lower blood glucose without causing hypoglycemia or β -cell burnout .

Concerning overweight and obese male and female groups treated with (RD) containing skim milk yogurt supplemented with lemon, fasting blood glucose level showed a significant decrease ($P < 0.05$) as compared to at baseline while overweight and obese male and female groups treated with (RD) containing skim milk yogurt supplemented with mixed cumin plus lemon (1:1 w/w)

induced a significant decrease ($P < 0.01$) in fasting blood glucose level. In this concern (*Jain et al., 1992*) suggested that oral administration of cumin seed powder lowered blood glucose level also accompanied by decrease in the area under the glucose tolerance curve hyperglycemic peak. Concerning lemon effect (*Kawi et al., 2000*) cleared that citrus flavonoids have biological activity including, antibacterial, antifungal anti-diabetic, anticancer and antiviral activities. In addition the fiber of citrus also contain bioactive compounds, such as polyphenol, the most important being vitamin C or ascorbic acid (*Ahmad et al., 2006*). Garcia-Diaz et al., reported that vitamin C inhibit glucose metabolism and leptin secretion on isolated adipocytes lead to an improvement in hyperglycemia and decrease glycosylation in obese diabetic models.

Effect of Regimen diet with or without Supplemented Yogurt with Cumin or Lemon on glucated Hemoglobin HbA_{1c} in Overweight and Obese Patients:

Table (6&7) illustrate the effect of (RD) without or with supplemented yogurt with cumin or lemon and mixed cumin plus lemon (1:1 w/w) on hemoglobin A_{1c} in overweight and obese male and female patients.

Results revealed that control (+ve) of overweight and obese male groups kept on their usual diet recorded a significant increase in HbA_{1c} values at baseline, while groups overweight and obese male and female treated with regimen diet (RD) (1200 and 1500 k.cal/d) recorded a significant decrease ($P < 0.01$) in HbA_{1c} as compared to at baseline.

Samah, A.S. Abdel-Shafy , Seham A.M. Tharwat , Ashraf. A. Abdel-Meged , Randa salam and Rehab H. Gaballah

On the other hand the (+ve) overweight and obese groups which treated with (RD) containing supplemented yogurt with cumin recorded a significant decrease ($P < 0.01$) in HbA_{1c} values as compared to at baseline.

Concerning male and female groups treated with (RD) containing supplemented yogurt with lemon induced a significant decrease ($P < 0.05$) in HbA_{1c} levels of overweight group only.

While overweight and obese male and female groups treated with (RD) containing supplemented yogurt with mixed (1:1 w/w) (cumin plus lemon) induced a high significant decrease ($P < 0.01$) in HbA_{1c} as compared to control group only treated with (RD).

The statistical analysis of results revealed a significant improvement in glycemic control as measured by the significant reduction in the level of glycosylated hemoglobin HbA_{1c} in all groups treated with yogurt supplemented with cumin and lemon the best result induced by mixture of cumin and lemon (1:1 w/w).

In this respect (**patil et al., 2013**) reported that the biologically active constituent cumin aldehyde inhibited aldose reductase and alpha glucosidase, cuminum able to lower blood glucose without causing hypoglycaemia or β -cell burn out.

Concerning lemon citrus, flavonoids have a large spectrum of biological activity including anti-diabetic (**Kauwil et al., 2000**). In addition the fiber of citrus fruit also contain bioactive compounds such as polyphenols, the most important being

vitamin C or ascorbic acid (*Ahmed et al., 2006*). Among beneficial effects of ascorbic acid on obesity related mechanisms, it has been suggested that this vitamin may modulate adipocyte lipolysis and inhibit glucose metabolism and leptin secretion (*Garcia-Diaz et al., 2014*).

Conclusion

In conclusion regimen diet containing yogurt supplemented with mixture of cumin and lemon (1:1 w/w) as a source of alkaloid, anthraquinone, coumarin, flavonoid glycoside in cumin and lemon polyphenols compounds significantly raise the effect of either component alone and induced a high significant decrease in BMI, fasting blood glucose and glycated hemoglobin in obese and overweight patient.

Table (1): Characteristics of Experimental Subject:

Groups Treatment	Group -1- # Control (+ve) (usual diet)		Group -2- # Regimen diet		Group -3- # Regimen diet containing cumin		Group -4- # Regimen diet containing lemon		Group -5- # Regimen diet containing cumin and lemon	
	Over-	Obese	Over-	Obese	Over-	Obese	Over-	Obese	Over-	Obese

Samah, A.S. Abdel-Shafy , Seham A.M. Tharwat , Ashraf. A. Abdel-Meged , Randa salam and Rehab H. Gaballah

Parameters	weight																			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F		
MI at baseline (mean ± SD)	27.0 ± 1.6	27.5 ± 1.3	32.7 ± 1.6	33.1 ± 1.3	27.7 ± 1.3	27.8 ± 1.3	32.4 ± 1.6	33.7 ± 1.0	27.5 ± 1.4	28.1 ± 1.0	33.8 ± 0.6	33.0 ± 2.0	27.2 ± 1.5	27.8 ± 1.5	33.3 ± 1.7	33.1 ± 1.4	28.3 ± 1.2	27.0 ± 0.9	31.8 ± 3.6	32.4 ± 1.4
Age (Y) (mean ± SD)	38.8 ± 3.4	40.2 ± 3.6	39.4 ± 2.4	41.6 ± 2.9	39.2 ± 3.7	40.4 ± 3.1	39.6 ± 3.3	39.0 ± 1.4	37.6 ± 2.7	38.0 ± 2.2	42.0 ± 1.4	39.6 ± 3.8	37.6 ± 2.7	41.2 ± 2.8	43.6 ± 1.7	38.6 ± 3.1	37.4 ± 2.9	41.4 ± 2.4	39.4 ± 3.5	39.0 ± 2.2

Table (2): Effects of Regimen diet with or without supplemented yogurt with cumin or lemon or the mixture of them on Body Mass Index in Male overweight or obese patients at baseline and after 12 weeks

Parameters (mg/dl)	Group -1- # Control (+ve) (usual diet)		Group -2- # Regimen diet		Group -3- # Regimen diet containing cumin		Group -4- # Regimen diet containing lemon		Group -5- # Regimen diet containing cumin and lemon		Anova Over- weight	LSD Over- weight	Anova obese	LSD obese
	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese				
BMI at baseline (mean ± SD)	27.0 ± 1.6	32.7 ± 1.6	27.7 ± 1.3	32.4 ± 1.6	27.5 ± 1.4	33.8 ± 0.6	27.2 ± 1.5	33.3 ± 1.7	28.3 ± 1.2	31.8 ± 3.6	0.650	-	0.585	-
BMI after 12 Weeks (mean ± SD)	a 28.18 ± 1.8	a 35.54 ± 2.7	b 24.04 ± 1.6	b 30.24 ± 2.8	bc 22.28 ± 1.7	bc 28.48 ± 1.0	bc 22.36 ± 1.3	bc 26.62 ± 3.7	c 21.90 ± 0.9	c 26.02 ± 3.7	0.000	1.996	0.000	3.875
T. test	0.003**	0.024*	0.000**	0.075	0.000**	0.000**	0.000**	0.002**	0.000**	0.000**				

Mean with the same letter are not significantly different

(*) significant at ≤ 0.05

(**) highly significant at ≤ 0.01

Table (3): Effects of Regimen diet with or without supplemented yogurt with cumin or lemon or mixture of them on Body Mass Index in Female overweight or obese patients at baseline and after 12 weeks

Parameters (mg/dl)	Group -1- # Control (+ve) (usual diet)		Group -2- # Regimen diet		Group -3- # Regimen diet containing cumin		Group -4- # Regimen diet containing lemon		Group -5- # Regimen diet containing cumin and lemon		Anova over- weight	LSD Over- weight	Anova obese	LSD obese
	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese				
BMI at baseline (mean ± SD)	27.5 ± 1.3	33.1 ± 1.3	27.8 ± 1.3	33.7 ± 1.0	28.1 ± 1.0	33.0 ± 2.0	27.8 ± 1.5	33.1 ± 1.4	27.0 ± 0.9	32.4 ± 1.4	0.686	-	0.743	-
BMI after 12 Weeks (mean ± SD)	a 31.6 ± 3.2	a 39.0 ± 3.9	b 24.0 ± 1.4	b 30.4 ± 1.0	bc 22.02 ± 1.4	bc 27.52 ± 2.5	c 21.04 ± 0.8	c 27.02 ± 1.7	c 20.92 ± 1.0	c 26.82 ± 1.4	0.000	2.3459	0.000	3.0619
T. test	0.038*	0.026*	0.001**	0.000**	0.000**	0.000**	0.002**	0.000**	0.000**	0.000**				

Mean with the same letter are not significantly different

(*) significant at ≤ 0.05

(**) highly significant at ≤ 0.01

Table (4): Effects of Regimen diet with or without supplemented yogurt with cumin or lemon or mixture of them on Fasting Blood Sugar in Male overweight and obese patients at baseline and after 12 weeks

Parameters (mg/foodl)	Group -1- # Control(+ve) (usual diet)		Group -2- # Regimen diet		Group -3- # Regimen diet containing cumin		Group -4- # Regimen diet containing lemon		Group -5- # Regimen diet containing cumin and lemon		Anova Over- weight	LSD Over- weight	Ano- va obe- se	LSD obese
	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese				
Fasting blood glucose at baseline (mean ± SD)	108.2 ± 8.8	103.8 ± 6.2	104.4 ± 5.2	109.8 ± 7.2	106.4 ± 5.6	108.8 ± 12.6	96.2 ± 4.4	108.0 ± 8.4	99.6 ± 7.1	97.0 ± 8.4	0.043*	-	0.174	
Fasting blood glucose after 12 Weeks (mean ± SD)	a 144.8 ± 47.9	a 113.8 ± 15.4	b 99.60 ± 2.9	b 92.40 ± 5.3	b 98.80 ± 4.5	b 88.60 ± 12.3	b 89.60 ± 9.1	b 83.0 ± 13.0	b 84.80 ± 5.6	b 83.00 ± 7.7	0.002**	29.12	0.002**	14.97
T test	0.175	0.317	0.148	0.004**	0.038*	0.043*	0.022*	0.034*	0.009**	0.011*				

Mean with the same letter are not significantly different

(*) significant at ≤ 0.05

(**) highly significant at ≤ 0.01

Samah, A.S. Abdel-Shafy , Seham A.M. Tharwat , Ashraf. A. Abdel-Meged , Randa salam and Rehab H. Gaballah

Table (5): Effects of Regimen diet with or without supplemented yogurt with cumin or lemon or mixture of them on Fasting Blood Sugar in Female overweight and obese patients at baseline and after 12 weeks

Parameters (mg/foodl)	Group -1- # Control (+ve) (usual diet)		Group -2- # Regimen diet		Group -3- # Regimen diet containing cumin		Group -4- # Regimen diet containing lemon		Group -5- # Regimen diet containing cumin and lemon		Anova Over- weight	LSD Over- weight	Anova obese	LSD obese
	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese				
Fasting blood glucose at baseline (mean ± SD)	104.4 ± 5.7	94.2 ± 8.3	103.4 ± 11.5	161.6 ± 35.1	113.8 ± 5.7	105.2 ± 5.3	103.8 ± 13.3	101.4 ± 16.6	100.2 ± 0.5	103.6 ± 5.4	0.178	-	0.000**	-
Fasting blood glucose after 12 Weeks (mean ± SD)	a 101.4 ± 2.3	a 103.6 ± 5.3	b 90.00 ± 4.2	b 90.60 ± 4.4	b 88.00 ± 8.5	b 85.60 ± 8.5	b 84.60 ± 14.7	b 85.60 ± 6.3	b 81.60 ± 5.4	b 83.40 ± 1.1	0.012*	10.885	0.000**	7.493
T. test	0.184	0.031*	0.012*	0.009**	0.000**	0.009**	0.002**	0.122	0.004**	0.007**				

Mean with the same letter are not significantly different

(*) significant at ≤ 0.05

(**) highly significant at ≤ 0.01

Table (6): Effects of Regimen diet with or without supplemented yogurt with cumin or lemon or mixture of them on HbA_{1C} level in Male overweight and obese patients at baseline and after 12 weeks

Parameters (mg/foodl)	Group -1- # Control (+ve) (usual diet)		Group -2- # Regimen diet		Group -3- # Regimen diet containing cumin		Group -4- # Regimen diet containing lemon		Group -5- # Regimen diet containing cumin and lemon		Anova Over- weight	LSD Over- weight	Anova obese	LSD obese
	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese				
Hb A1C at baseline (mean ± SD)	5.8 ± 0.7	6.0 ± 0.5	6.1 ± 0.2	6.1 ± 0.2	6.0 ± 0.1	6.0 ± 0.5	5.7 ± 0.3	5.8 ± 0.2	5.6 ± 0.2	5.6 ± 0.3	0.263	-	0.233	
Hb A1C after 12 Weeks (mean ± SD)	a 6.30 ± 0.4	a 6.34 ± 0.2	b 5.54 ± 0.2	b 5.66 ± 0.3	bc 5.38 ± 0.1	bc 5.44 ± 0.3	bc 5.28 ± 0.3	c 5.32 ± 0.2	c 5.10 ± 0.2	c 5.30 ± 0.2	0.000**	0.34	0.000**	0.30
T test	0.349	0.301	0.004**	0.061	0.000**	0.023*	0.021*	0.010**	0.001**	0.030*				

Mean with the same letter are not significantly different

(*) significant at ≤ 0.05

(**) highly significant at ≤ 0.01

Table (7): Effects of Regimen diet with or without supplemented yogurt with cumin or lemon or mixture of them on HbA_{1C} level in Female overweight and obese patients at baseline and after 12 weeks

Parameters (mg/foodl)	Group -1- # Control A (usual diet)		Group -2- # Regimen diet		Group -3- # Regimen diet containing cumin		Group -4- # Regimen diet containing lemon		Group -5- # Regimen diet containing cumin and lemon		Anova Over- weight	LSD Over- weight	Anova obese	LSD obese
	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese	Over- weight	Obese				
Hb A1C at baseline (mean ± SD)	5.8 ± 0.3	5.6 ± 0.6	6.0 ± 0.3	6.3 ± 0.2	5.9 ± 0.4	5.7 ± 0.2	5.9 ± 0.2	5.7 ± 0.4	5.6 ± 0.4	5.7 ± 0.3	0.373	-	0.03 8*	-
Hb A1C after 12 Weeks (mean ± SD)	a 5.58 5.5 ± 0.3	a 5.78 5.8 ± 0.3	a 5.54 5.6 ± 0.1	b 5.38 5.4 ± 0.3	a 5.24 5.3 ± 0.2	b 5.36 5.4 ± 0.2	a 5.34 5.4 ± 0.3	b 5.28 5.2 ± 0.1	a 5.32 5.3 ± 0.3	b 5.24 5.3 ± 0.2	0.41 9	0.34	0.00 4**	0.27 4
T. test	0.336	0.525	0.055	0.004**	0.069	0.082	0.032*	0.063	0.009**	0.005**				

Mean with the same letter are not significantly different

(*) significant at ≤ 0.05

(**) highly significant at ≤ 0.01

Samah, A.S. Abdel-Shafy , Seham A.M. Tharwat , Ashraf. A. Abdel-Meged , Randa salam and Rehab H. Gaballah

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التأثير المحتمل لليمون والكمون على خفض الوزن ومستوى سكر الدم
على مرضى السمنة وزيادة الوزن

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الملخص العربى

تعتبر السمنة وزيادة الوزن من أكثر العوامل المؤدية للإصابة بالأمراض والوفاة، ويصاحب السمنة مستويات غير طبيعية لسكر الدم ومستويات الدهون مما يعرض الأشخاص للإصابة بالأمراض. وقد أجريت هذه الدراسة لمعرفة تأثير النظام

الغذائي بدون أو مع احتواءه على الزبادى المدعم بالليمون، الكمون، خليط الليمون مع الكمون على خفض الوزن، مستوى سكر الدم صائم ومستوي السكر التراكمي.

وقد شملت الدراسة عينة عشوائية من ١٠٠ مريض (٥٠ ذكور، ٥٠ إناث) مصابين بالسمنة أو زيادة الوزن، تم اختيارهم من العيادة الخارجية لمستشفى القصر العيني تتراوح أعمارهم ما بين (٣٥ – ٤٥ عام). وقد تم تقسيمهم إلى خمس مجموعات تشمل كل مجموعة على ٢٠ مريض (١٠ ذكور، ١٠ إناث).

وقد تم تسجيل وزن الجسم كما تم جمع عينات الدم من جميع المرضى من بداية التجربة، وأيضاً بعد مرور ١٢ أسبوع مرة ثانية وذلك لتحديد BMI وقياس سكر الدم ومعدل السكر التراكمي.

وقد تم ترك المجموعة الأولى بدون نظام غذائي (على نظامهم الغذائي المعتاد) واعتبرت هذه المجموعة مجموعة ضابطة موجبة أما المجموعة الثانية فتم وضعها على نظام غذائي يمد بـ (١٢٠٠ كيلو كالورى (٦٠ جم بروتين، ٤٠ جم دهون و ١٥٠ جم كربوهيدرات)، ١٥٠٠ كيلو كالورى (٧٥ جم بروتين، ٥٠ جم دهون و ١٨٧,٥ جم كربوهيدرات) كلهم يعانون من السمنة وزيادة الوزن على التوالي وذلك تبعاً لمؤشر كتلة الجسم، كما تم وضع المجموعة الثالثة على نفس النظام كالمجموعة الثانية مع إضافة جرعة من الكمون بمعدل ٥ جم/ في اليوم لمدة ١٢ أسبوع، ثم وضع المجموعة الرابعة على نفس النظام الغذائي مع إضافة جرعة من الليمون بمعدل ٥ جم/ في اليوم لمدة ١٢ أسبوع. أما بالنسبة للمجموعة الخامسة تم وضعها على نفس النظام الغذائي مع إضافة جرعة خليط من الكمون والليمون (٢,٥ جم وزن، وزن لكل منهما) في اليوم لمدة ١٢ أسبوع.

Samah, A.S. Abdel-Shafy , Seham A.M. Tharwat , Ashraf. A. Abdel-Meged , Randa salam and Rehab H. Gaballah

وقد كان التدعيم من خلال إضافة الكمون، الليمون إلى اللبن المنزوع الدسم خلال تصنيع الزبادى المقدم لأفراد العينة ضمن النظام الغذائي المحدد لهم لمدة ٦ أيام أسبوعياً قبل تناول الإفطار أو الغذاء بعشرين دقيقة.

وبعد ١٢ أسبوع من إتباع الأنظمة المختلفة (١٢٠٠، ١٥٠٠ كيلو كالورى) المعززة بالإضافات) أظهرت النتائج أن ذلك أدى إلى انخفاض معنوى في كلا من مؤشر كتلة الجسم، مستوى سكر الدم صائم، والسكر التراكمي وذلك مقارنة بقياساتهم عند بداية التجربة، وكذلك بالمقارنة بالمجموعة الضابطة الموجبة التي تم وضعها على النظام الغذائي المحدد السرعات بدون الزبادى المدعم.

وقد أوضحت النتائج أن النظام الغذائي المحتوى على الزبادى منزوع الدسم المدعم بخليط الكمون والليمون (١:١) وزن إلى وزن قد رفع من كفاءة تأثير كلا من الكمون والليمون منفرداً مما أدى إلى زيادة الخفض المعنوى لكلا من مؤشر كتلة الجسم، مستوى سكر الدم صائم والسكر التراكمي في مرضى السمنة وزيادة الوزن.