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Effect of Calcium and Vitamin D Supplementations during weight loss on Some Anthropometric Measurements. In Peri menopausal women, Zagazig University Club

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Abstract: - Introduction new research suggests that calcium and vitamin D supplements may be useful in preventing weight gain during menopause. Women going through menopause often experience unusual weight gain, especially around the abdomen, which can be a risk factor for other health problems, such as heart diseases .So we aimed to assess the influence of ca and vitamin d on the anthropometric measurements in preimenopausal overweight and obesity females, in the fitness club at Zagazig University.

Material and methods; This was a interventional study conducted for three months on 146 women who fulfilled the selection criteria and randomly allocated in the studied groups each group was 73 females participating in the weight loss program (balanced low caloric diet with planned exercise program) alone (control group),or with ca and vitamin d supplement (supplement group) .for quantitative data analysis a student t test was used .

Results, the studied groups aged around 45.7 years (38-50), showed no significant difference ($p>0.05$) as regards all the demographic variables and anthropometric measurements before the intervention. After the intervention, there was a statistical significant reduction in the WC, body Wt., and BMI at the supplement group ($p < 0.05$).

Conclusions, Ca and vitamin d is very important component in the weight reduction programs for perimenopausal women and for heathy menopause.

Keywords: - ca, vitamin d, overweight, obesity, perimenopause.

Introduction:

The National Health and Nutrition Examination Survey (NHANES III), reported that, about 65% of women aged from 40 to 59 years are either overweight or obese, that percentage increased to be nearly 68% in women older than 60 y (2), because the reduction in the resting energy expenditure (7).

Low level caloric restriction causes loss of muscle mass and decline in metabolic rate (8) that results in short-term weight loss, and bone loss that increase the risk of osteoporosis (9). Dieting energy restriction attenuates Ca absorption (17) and results in lowered amounts of Ca and vitamin D consumed (16).

Increase calcium intake associated with decreased adiposity and reducing the obesity risk (19) , aids in weight loss in obese who consuming a calorie-deficient diet ,(20) and also inhibits weight regain in mice during refeeding (18) ,acute calcium intake reported to correlate significantly with fat oxidation in humans (21). the mechanisms is that Increasing dietary calcium intake increases oxidation of fat , inhibits parathyroid hormone (PTH) secretion and, subsequently, the activation of 25 hydroxycholecalciferol to 1,25 dihydroxycalciferol(vitaminD3)(21),that targeted Adipocytes,PTH stimulates a dose-dependent rise in adipocyte intracellular calcium levels that is due to both increased influx and mobilization of intracellular stores (22). VD3 elicit an increase in intracellular Ca++ levels (18) that inhibits lipolysis in adipocyte stimulated by the β-adrenergic receptor pathway, leads to decrease cAMP levels and reduce HSL phosphorylation. These effects mediated primarily through activation of phosphodiesterase 3B (24). Low dietary calcium intakes and increased circulating VD3 may also have indirect inhibitory effects on adipocyte lipolysis by regulating the use of lipolytic substrates for energy metabolism (25). Calcitropic hormones inversely regulate the level of intracellular calcium in adipocytes and may contribute to effects of dietary calcium on adiposity. (26).

Peri menopausal exercise is important because it improve mood, promote a healthy weight and protect muscles and bones (10). Resistance training with weights or bands is extremely effective at preserving or even increasing lean muscle mass, which normally declines with age and hormonal changes (11). Although all types of resistance training are beneficial but performing more repetitions is better, especially for reducing belly fat (12).Cardio (aerobic exercise) is also effective in peri menopausal women because it reduce belly fat while preserving muscle during weight reduction (13). So, the best strategy is a mix of strength training and aerobic exercise (14).

The Continuing Survey of Food Intakes by Individuals (4) and the Quebec Family Study (5) show an inverse relationship between vit D, calcium intake and both body mass index (BMI) and the risk of obesity.

Menopause transition is a risky period in a woman's life, 'triggering' adverse metabolic and cardiovascular processes that leads to a greater incidence of obesity-related comorbidities. Dietary, exercise, and hormonal interventions that targeted at premenopausal women may help mitigate the worsening cardiovascular and metabolic risk profile during menopause. (7)

So here, we conducted this interventional study to evaluate the effectiveness of applying Calcium and Vitamin D Supplementations on weight loss strategies in peri menopausal women.

Objectives: in this study, we aimed to improve the overall health status of the pei menopausal women. Through the following objective; to investigate the effect of weight loss program (caloric restriction, exercise intervention,) alone versus with ca and vit d supplement on Overweight and obese (BMI>25-<40KG/m2) peri -menopausal women (31-<50y) on three months. The study conducted from April to August 2017.

Methodology: through an intervention clinical trial study design applied on 146 women fitness club at Zagazig University, whom fulfill the selection criteria (aged >35-<50y), without any mental, medical or psychological disorders), with BMI (<25-40 kg/m2), randomly assigned to 2 groups: 1) diet modification and exercise (n = 73), or 2) diet modification and exercise + ca ,vit d (n = 73). The diet intervention based on reduced-calorie program (low balanced caloric restriction 500 Kcal /d). The exercise program consisted of daily aerobic activity of (moderate-to-vigorous intensity) for 5 days per week. The supplementation were Ca (1000mg/d) +vitd (400IU/d)(1).the base line anthropmetric measurements; WC (waist circumference), BMI(body mass index), TFP(total body fat) and serum ca++ and 25-hydroxyvitamin D were recorder then after 3 mon because Measuring of serum free (ionized) calcium (Ca^{++}) reflects true calcium status of the body in health and disease(27).

Data was analyzed by using SPSS (version 20) and presented in the suitable method, P-value ≤ .05 considered as significant and 95% of Confidence Interval which 80% the power of the study .mean

,median and SD (standard deviation) were used for quantitative data summarization ,while student and paired t test were used for their analysis .number and percentage for qualitative data summarization, and chi square test for analysis .for the association between serum Ca++ ,vit D and percentage of change BMI ,WC persons correlation coefficient

Ethical Considerations procedure: Participants got informed consent before participated in the study

Results ; Finally, 140 women out of 146 participated in this study completed the weight loss program (diet caloric restriction) for 3 mon and provided anthropometric measurements and a blood sample before and after the program, As six subjects were excluded as lost during the follow up.

We founded that no significant difference in the relevant variables between groups before the intervention (at baseline), (**Table 1**). The women consumed (6.1 ± 3.8) (4) µg vitamin D (mean ± SD) (median) from diet. About (56.4%) of subjects reported regularly use of vitamin D supplements, with a mean intake of 531 IU/d (equivalent to 13.3 µg/d). no change in the Reported vitamin D intake from baseline to 3 mo in the studied groups. (Table 1).

Table no (1) shows the socio-demographic variables among the studied groups.

	Control group diet +exercise No=70	Supplement group No=70	P of test
Age(y) Mean+_SD 35-<40 40-<45 45-<50	 40.7+_9.7 11(15.7) 39(55.7) 20(28.6)	 41.8+_11.4 14(20.0) 37(52.9) 19(27.1)	(00.61)2
Residence Urban Rural	 46(65.7) 24(34.3)	 51(72.9) 19(27.1)	(0.48)3
Parity	3.4+_1.6	3.3+_1.7	(0.72)2
Previous hormonal therapy	22(31.4)	26(37.1)	(0.48)3
Source of vit d (1) *dietary +sun *supplement regular *supplement irregular	 19(27.4) -- 13(15.7)	 22(31.4) 3(4.3) 67(95.8)	(0.58)3 (0.00*)3
Source of ca (1) *dietary *supplement regular *supplement irregular	 27(38.6) --- 17(24.3)	 37(52.9) 5(7.1) 65(92.9)	 (0.09) (0.00*)

1) Self-reported *there was significant difference
2) P of t test 3) of chi-square

This trial intervention adherence data, weight loss, and body-composition changes were previously reported (28). The median % of reduction in BMI was 7% (P = 0.00) in the control (diet +exercise) group 9% (P < 0.001) in the supplement group,all intervention groups had a significant decrease in WC (control: P = 0.002; supplement: P < 0.00) and in body fat percentage (all P < 0.001). (Table 2)

Table (2) shows the pre-post anthropometric measurements among the studied groups.

	Control group diet +exercise No=70	Supplement group No=70	P of t test
Pre WC(cm) Post WC P of Paired t test Median %of change	122.4+_23.5 114.7+_8.9 0.00* -7%	120.9+_25.6 110.8+_10.9 0.00* -9%	0.72 0.02*
Pre BMI(kg/m2) Post BMI	32.7+_7.5 29.5+_8.1	33.1+_8.1 27.1 +-5.1	0.76 0.04*

P of Paired t test Median %of change	0.00* -9.2%	0.00* -11.7%	
Pre TBF(%) Post TBF(%) P of Paired t test Median %of change	35.8+_5.4 31.9+_6.7 0.00* -10.5%	35.1+_6.1 29.1+_4.1 0.00* 13.4%	0.47 0.04*

The serum ca++ significantly reduced (-4.5%) in the control group while insignificantly elevated in the supplement group (1.8%) ,while the level of 25 –hydroxyl vitamin D is significantly increased in the supplement group(14.7%) and reduced non-significantly in the control group(-2.7%).

Table (3) shows the pre-post laboratory measurements among the studied groups.

	Control group diet +exercise) No=70	Supplement group No=70	P of student t test
Pre serum ca++ Post serum ca++ P of Paired t test Mean %of change	11.1+_1.9 10.6+_2.1 0.01* -4.5	11.3+_2.1 11.5+_1.9 0.55 +1.8	0.56 0.00*
Pre 25-hydroxyvitamin D) Post 25-hydroxyvitamin D P of Paired t test Mean %of change	31.8+_2.1 30.9+_3.5 0.07 -2.8%	31.3+_2.9 35.9+_4.1 0.00* 14.7	0.24 0.00*

The level of serum ca++ and 25-hydroxyvitamin D is significantly had an inverse relationship with (WC,TBF,and BMI). With age the level of serum ca++ had a poor insignificantly decreased association (0.57),while not affect the serum vit d

Table no (4) shows the correlation between serum Ca++ and25-hydroxyvitamin D and % of change in WC, BMI

	Serum ca++ r(p)	25-hydroxyvitamin D R(p)
WC	-0.61(0.00*)	-0.55(0.00*)
BMI	-0.46(0.00*)	-0.40(0.00*)
BFT	-0.31(0.03*)	-0.43(0.00*
Age	-0.11(0.57)	0.09(0.88)

Discussion:

Based on the recently reported observational data there was a relationship between an increased risk of obesity and low calcium intake has become apparent, (6) .so in this study we investigate the effect of weight loss program for 3 month (caloric restriction, exercise intervention,) versus with ca and vit d supplement on Overweight and obese peri -menopausal women.

There was a significant reduction in the (WC, TBF,and BMI) in the supplementation group compared to control group ,that consistent with, Additionally, a short-term (≤3 mo) study showed a beneficial effect of Ca supplementation during weight reduction in a heterogeneous population (15).

In this study TBF is associated with lower serum 25(OH) D is consistent with this pathway and suggests that weight reduction leads to increased 25(OH) D concentrations through decreased peripheral sequestration. Although our findings indicate that 12 month of weight reduction achieved through caloric restriction and an exercise interventions insignificantly increase serum 25(OH) D relative to values in the supplementation subjects, the greater weight loss was associated with increased 25(OH) D in a dose-dependent manner, independent of changes in dietary vitamin D intake. The correlation between serum 25(OH)D and BMI changes was −0.40, which was similar to the inverse correlation (r = −0.27, P = 0.013) between change in BMI and 25(OH)D reported by Reinehr et al (29), and Caitlin et al (31)

The effect of weight loss on vitamin D has been examined in a few, and small studies. Riedt et al (32) randomly assigned 47 overweight postmenopausal women to receive either 1 g/d (*n*= 24) or 1.7 g/d (*n* = 23) of ca supplement while weight-reduction program for 6 month. The average weight loss was nearly equal in both groups (−9.3± 3.9% body weight) and was associated with a modest but in significant increase in 25(OH)D (11.9 ±29.2 and 6.9 ±22.3 ng/mL, respectively) compared with baseline. Tzotzas et al (32) measured serum 25(OH) D after weight loss with low caloric diet induced by 20 wk in26 of 37 women who completed the intervention. The mean loss of weight was 9.7% of body weight, and mean serum 25(OH) D increased from 15.4 to 18.3 ng/mL (+2.9 ng/mL; $P < 0.05$). Similarly, the mean concentration of serum 25(OH)D increased 2.9 ng/mL (from 31.3to 35.9 ng/mL) in 70 perimenopausal women who followed weight-reduction program for 12wk achieved a mean loss of 11.5% initial body weight (30).

Our findings were consistent with those of previous studies (29, 30); women who lost 10–14.9% of body weight over 12 month had an increase in serum 25(OH) D of 2.9 ng/mL. In a reanalysis of three calcium intake trials, investigators found a similar inverse relationship between BMI and calcium intake in two studies of perimenopause women as well as significant weight loss in a controlled trial of calcium supplementation in older women(3).

The major strengths of the study; its large sample size, excellent intervention adherence and study retention.

Conclusion :This results indicate that vitamin D and ca++ status is significantly improved and aid in significant reduction in WC,TBF, and BMI in comparison with weight loss program under similar conditions of(caloric restriction ,exercise program) in peri –menopausal women . Although additional studies are needed to confirm these findings.

Recommendation; Ongoing research to better understand the role of vitamin D in pathways influencing energy balance may lead to a clearer understanding of optimal vitamin D concentrations for promoting women health ..

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