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Effects of Slim Quick and Fat-stop on Adiponectin and Orexin in Rats

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Abstract

Introduction: Orlistat or fat-stop is among the synthetic drugs and slim quick is one of the popular herbal remedies used for obesity and overweight. The aim of this study was to investigate the effects of slim quick and fat-stop synthetic drug and comparing their effects on the serum concentration of adiponectin and orexin hormones, as well as body weight changes in adult female rats. Method: In this experimental study, 32 adult male Wistar rats were divided into four equal groups of eight rats: a control group, slim quick group (200 mg/kg), fat-stop group (200 mg/kg), and the group received slim quick (200 mg/kg) and fat-stop (200 mg/kg) simultaneously. The drugs were administered by oral gavage to animals. Twenty-nine days after the start of the experiment and after weighing the animals, cardiac puncture was performed and the serum concentration of adiponectin and orexin hormones were measured. The results were analyzed using ANOVA and Duncan test. The significance level was set at $p \leq 0.05$. Results: The results showed that there was a significant decrease in serum level of orexin hormone in both groups received slim quick and fat-stop compared to the control group; however, the serum level of adiponectin hormone did not show a significant change compared to the control group. In addition, the serum level of adiponectin hormone revealed a significant increase in the group received slim quick and fat-stop simultaneously and the serum level of orexin hormone was significantly decreased compared to the control group. Conclusion: According to the results, simultaneous administration of slim quick and fat-stop reduces body weight by increasing the serum level of adiponectin hormone and decreasing serum orexin level.

Keywords: Slim Fast, Fat-Stop, Adiponectin, Orexin, Body weight, Rat

Introduction

Orlistat or fat-stop (*brand* name, Xenical) is one of the few approved synthetic medications used for long-term weight management. Orlistat acts by inhibiting triacylglycerol lipase enzyme in the gastrointestinal tract. The inhibition of lipases will consequently inhibit the absorption of dietary fats, leading to a reduced caloric intake (Filippatos & et al, 2008; Athyros & et al, 2011). In addition, slim quick is an herbal medication or supplement used for the treatment of obesity and overweight. It contains natural extracts like celery, dill and green tea (Kianbakht, 2010). Clinical studies have shown that essential oil present in celery and dill has a positive effect on the *appetite*-regulating centers in the brain (arcuate nucleus of the hypothalamus), resulting in a delay in the transmission of hunger signals. Further, the flavonoids present in the product *have* been found to show inhibitory effects on the lipogenase enzyme. Many clinical trials have also demonstrated that it has the potential to lower the blood pressure and cholesterol levels. Celery and dill (fruit) seeds exert their synergistic effects on the region of the *brain* associated with hunger resulting in its inhibition. The active ingredients in the herbal product increase the fat metabolism and reduce blood pressure, as well as prevent lipid digestion and absorption in the small intestine. Furthermore, the caffeine found naturally in the green tea inhibits the trancellular phosphodiesterase enzyme and boosts the norepinephrine impacts in the body. Green tea catechins (GTCs) with caffeine haves been reported to inhibit the action of COMT enzyme, and thus leads to an increase in the serum concentration of catecholamines and an increase in metabolic rate (Mehdizade & et al, 2009; Chacko & et al, 2010). Green tea decreases body weight and increases energy expenditure through increasing the fat oxidation in the liver (Venables & et al, 2008). Therefore, this pill reduces the risk of developing type 2 diabetes. Numerous studies have demonstrated the impact of fat-stop on the appetite- and weight-regulating hormonal mechanisms such as leptin, adiponectin and ghrelin (Derosa, G., Maffioli, P., & Sahebkar, A. (2016).

However, to our knowledge, no study has been found that assessed the effects of slim quick medication on the appetite-regulating hormones. Therefore, given the easy availability of herbal medicines and its efficacy and safety compared with synthetic drugs, as well as their popularity for weight loss and weight management among people and researchers, the present study aimed to examine and compare the effects of these two medications on the two adiponectin and orexin hormones and changes in body weight.

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Materials and Methods

32 adult male Wistar rats weighting between 180-200 g were recruited for this experimental study. The rats were kept in animal breeding room of Jahrom University of Medical Sciences for a week to adapt to the environment. During the research, the animals were kept under 12 hours of light and 12 hours of darkness conditions and ambient temperature of 20-25 °C and had free access to food and water.

The rats were randomly divided into 5 groups of 8 animals as follows:

Control group: This group did not receive any treatment during the experimental period (28 days).

Experimental Groups 1 (Slim Quick): This group received slim quick at a dosage of 200 mg/kg dissolved in 1 ml distilled water by gavage based on body weight during the experimental period (28 days).

Experimental Groups 2 (Fat-stop): This group received fat-stop at a dosage of 200 mg/kg dissolved in 1 ml distilled water by gavage based on body weight during the experimental period (28 days).

Experimental Groups 2 (Slim Quick and Fat-stop): These groups received fat-stop and slim quick dose at a dosage of 200 mg/kg dissolved in 1 ml distilled water by gavage based on body weight during the experimental period (28 days).

At the end of the study (on the 29th day) after weighing the animals, their blood were directly taken from the heart by 5 cc syringe (anesthetized by Diethyl ether); and their serum was collected by centrifugation (15 min, 3000 rpm); and they held in a freezer at -20 °C until examination time. ELISA kits for rats were used to measure adiponectin and orexin hormones. One-way analysis of variance (ANOVA) was used to analyze the data. Duncan test was used to find the differences between means in cases in which statistical difference was significant in different groups. Statistical analysis was performed using SPSS version 21 and significant levels were statistically considered with $P < 0.05$. The data were calculated and compared in the results' section as Mean ± SEM.

Results

According to the findings in Table 1, there was no significant change in the serum level of adiponectin in the group received slim quick (200 mg/kg) compared with the control group ($P <0.05$); however, serum level of orexin showed a significant decrease compared with the control group ($P <0.05$). In addition, based on the average body weight changes, the dose 200 mg/kg slim quick resulted in the significant reduction in the body weight compared to the control group ($P <0.05$). No significant change was found in the serum level of adiponectin received fat-stop (200 mg/kg) compared with the control group ($P <0.05$); however, the serum level of orexin was significantly decreased compared to the control group ($P <0.05$). Further, the average body weight changes showed a significant decrease in body weight in all three experimental groups compared to the control group ($P <0.05$). A significant increase in serum level of adiponectin and a significant decrease in serum level of orexin were found in the group received fat-stop and slim quick simultaneously compared to the control group ($P <0.05$). The results also showed that the simultaneous administration of the slim quick and fat-stop increased the efficacy of adiponectin as compared *with* either drug alone.

Table 1- Comparison of serum levels of adiponectin and orexin hormones and body weight in different experimental groups with control group

Group / Variable	Control	Slim quick 200 mg/kg	Fat-stop 200 mg/kg	Slim quick 200 mg/kg and fat-stop 200 mg/kg
Adiponectin (Pg/µl)	11.6 ±1.32 ab	13.77± 1.32 ab	14.25± 0.94 ab	18.15± 2.59b
Orexin (Pg/µl)	311± 9.16 ab	254.825 ±7.42 ab	267.95 ±10.18a	242.32 ±8.75a
Average body weight changes	31.25± 1.65 ab	9.75 ±1.37 ab	17.5 ±2.88 b	-4.25 ±1.36a

According to Duncan test, the means in each row having at least one common letter, they are not significantly different at 5% level of Duncan test.
The averages are presented as Mean ±SEM
$P<0.05$ is statistically considered significant.

Discussion and Conclusion

The results of the current study showed that there was no significant increase in serum levels of adiponectin in rats fed a normal diet compared to controls in each of the groups received the slim quick and fat-stop alone. Adiponectin is a 244-amino-acid-long polypeptide, which is secreted from adipose tissues directly into the blood stream (Jardé & et al, 2009). Plasma adiponectin levels *in* normal healthy individuals are 10 µg/mL, where it accounts 0.01 percentage of all plasma proteins (Barb & et al, 2007). Adiponectin circulating in plasma exists in three forms of low molecular weight trimmers (LMW) and high molecular weight oligomers (HMW), with HMV has the highest concentration (Barb & et al, 2007; Kelesidis, Kelesidis & Mantzoros, 2006). Serum adiponectin level has a reverse correlation with body mass index (BMI) and decreases with obesity, insulin resistance, type 2 diabetes and impaired fat metabolism (Hara & et al, 2005). In vitro and in vivo studies in rodents have shown that adiponectin lowers blood glucose,

prevents lipid accumulation in skeletal muscles (Yang & et al, 2006). Adiponectin induces acetyl-CoA carboxylase phosphorylation and inhibits the synthesis of lipids through stimulation of AMPK (AMP-activated protein kinase). Furthermore, it enhances the expression of the genes involved in the oxidation of fatty acids and decreases skeletal fatty acids levels of free fatty acids through oxidation, lowering the content of triglyceride in the muscle (Gable, Hurel & Humphries, 2006; Gil-Campos, Cañete & Gil, 2004). The results also showed no significant increase in serum levels of adiponectin in rats fed normal diet compared with controls in each of the groups received the slim quick and fat-stop alone. Thus, the weight loss observed in the slim quick and fat-stop groups is associated with a decrease in the orexin level. Orexin neurons respond to several metabolic signals that reflect the state of energy resources. Hypothalamic preproorexin mRNA levels are increased significantly after 48 h of fasting and by acute (6 h) insulin-induced hypoglycemia suggesting activation of these neurons under conditions of hunger (Sakurai & et al, 1998), increasing the activity of neurons involving in hunger. *ICV administration* of orexin-*A* and *B* in rats leads to a dose-dependent increase in feeding (Sakurai & et al, 1998). Several findings supported the additive increase of orexin A in many species (Martynska & et al, 2005). Orexin directly regulates neuropeptide (NPY) Y, pro-opiomelanocortin (POMC), and glucose-responsive neurons in the arcuate nucleus and ventromedial nucleus of *hypothalamus* supporting the orexigenic function of orexin. The comparison of the group received the slim quick and fat-stop with other groups showed that the simultaneous use of the medications increased the efficacy of adiponectin as compared with either drug alone and serum levels of orexin hormone was significantly decreased as well. Therefore, the observed weight loss in the group received slim quick and fat-stop simultaneously is correlated with increasing serum level of adiponectin and decreasing serum level of orexin. The key ingredient in slim quick supplement is green tea. Catechins have been reported to suppress adipocytes, reduce adipose tissue weight, and regulate fat metabolism. Many researchers suggest that the catechin present in green tea can improve the translation activity and expression of adiponectin through direct binding to the peroxisome proliferator-activated receptor γ (PPAR γ) *(*Shin & et al, 2009). Similarly, Chou et al. measured the expression and secretion levels of adiponectin protein after administration of each green tea polyphenols in 3T3-L1 adipocytes and found elevated adiponectin levels as a result of green tea intake (Cho & et al, 2007). In a recent systematic study, Derosa et al. (2016) reviewed the studies published between 2004 and 2010 on Orlistat. They found that Orlistat significantly increased plasma concentrations of adiponectin and decreased leptin concentrations and C-reactive protein (CRP) levels in obese or overweight subjects (Derosa, Maffioli & Sahebkar, 2016).

General Conclusion:

Simultaneous administration of slim quick and fat-stop increases the efficacy of adiponectin and reduces body weight compared with either drug alone. *Given the* popularity of herbal medications or supplements for *weight loss* and weight management among people, it seems that the simultaneous administration of herbal remedy along *with* the synthetic drugs could reduce the side effects of synthetic drugs and increase their effectiveness for weight loss.

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