Ain Shams University
Women's College
Biochemistry and Nutrition
Department

" Serum Leptin and Insulin Levels in Relation to Blood Lipids Profile in Obesity and Hyperlipidemia"

Thesis
Submitted to Women's College Ain Shams University
In partial fulfillment for the requirements of
The degree of Ph.D. in Science Biochemistry and Nutrition

BY

Amira Abd El-Rhman Abd El-Hamid
M. Sc. Degree in Science
Biochemistry and Nutrition, Women's College
Ain Shams University

Under Supervision of

Prof. Dr. Mona Ahmed Sadek
Professor of Nutrition, Biochemistry and Nutrition Department
Women's College. Ain Shams University

Dr. Fatma Abd El Hamid Khalil
Assistant Professor of Nutrition, Biochemistry and Nutrition Department
Women's College. Ain Shams University

Dr. Madeha Fahmy Hassan
Lecturer, Biochemistry and Nutrition Department
Women's College. Ain Shams University

Dr. Amal Hassanein Mohammed
Lecturer, Biochemistry and Nutrition Department
Women's College. Ain Shams University

Dr. Lamiaa Abdou Lateaf Ali Barakat
Lecturer, Biochemistry and Nutrition Department
Women's College. Ain Shams University

٢٠١٠

Abstract

Obesity and hyperlipidemia are two of the most highly distributed disorders that commonly associated with a cluster of progressive pathogenesis of many public health problems. This nutritional diseases increase the morbidity and the mortality of other diseases as cardiovascular diseases, atherosclerosis, hypertension, type2 diabetes, osteoarthritis and certain types of cancer. Thus the goal of the present study was to investigate the anthropometric measurements and biochemical parameters in case of obese and hyperlipidemic patients before and after treatments as well as the biological, biochemical and microscopical changes in both of obese and hyperlipidemic hamsters in comparison with their corresponding healthy subjects and hamsters respectively. To confirm the objectives blood glucose, serum insulin and serum adiponectin in relation to appetite related hormones; leptin and ghrelin in addition of lipids profile and oxidative stress status were examined. The results of the two sections showed that:-

1. Anthropometric measurements in human subjects showed a significant decrease in body weight, BMI and BFM in obese subjects after dietary treatment compared with their corresponding values before treatments.
2. The biological measurements in hamsters showed a significant increase in final body weight, body weight gain, food intake, FER and relative weight of liver in obese hamsters fed on HF-HS diet compared with the corresponding values in healthy control hamsters. While hyperlipidemic hamsters showed a significant increase $P<0.01$ in FER compared with healthy control hamsters.
3. There was a significant increase in serum glucose, insulin and IR value in both of obese and hyperlipidemic subjects. While after dietetic treatment for obesity and hyperlipidemia there was a significant decrease in serum glucose, insulin and IR associated with a significant increase in serum adiponectin levels. Human results go hand in hand with the animal results in serum glucose, insulin, IR and adiponectin.
4. Serum leptin concentration increased significantly in both of obese and hyperlipidemic subjects associated with a significant decrease in serum ghrelin concentration in obese group only. After dietary treatment serum leptin concentration decreased significantly in both of obese and hyperlipidemic subjects while serum ghrelin increased significantly when compared with their values before treatments. Human results agreed with the animal results of appetite related hormones.
5. Obesity and hyperlipidemia significantly increased serum total lipids, total cholesterols, LDL-C and VLDL-C associated with a significant decrease in serum HDL-C. In addition obesity and hyperlipidemia were associated with increased serum FFAs, atherogenic index and risk factor (ratio of LDL-C/ HDL-C) in comparison with the healthy control subjects. Consuming dietary treatments modulated lipids profile compared with the values before treatments. The results of human subjects run in agreement with the animal results of lipids profile.
6. The antioxidant enzymes; SOD, CAT & GPx activities and the concentration of reduced glutathione GSH decreased significantly in both of obese and hyperlipidemic subjects compared with healthy control subjects. While after dietary treatment there was a significant increase in the activities of antioxidant enzymes and the concentration of reduced glutathione when compared with the values before treatments. The human results are confirmed by the animal results of oxidative stress status.
7. The results of hepatic total lipids, total cholesterol and triacylglycerols in both of obese and hyperlipidemic hamsters showed a significant increase when compared with the corresponding healthy control hamsters.
8. The microscopical examination of liver and pancreas sections in healthy, obese and hyperlipidemic hamsters showed that, a mild hepatic macrovesicular steatosis with mild accentuation of fat staining in hepatocytes and inflammatory changes of liver of obese and hyperlipidemic hamsters compared with the liver of healthy control hamsters. In addition, the lipids deposits with aciner atrophy and macrophage infiltration in the pancreas in obese and hyperlipidemic male hamsters compared with healthy control hamsters.

List of Contents

List of Tables

List of Figures

AIM OF THE WORK

Obesity and hyperlipidemia are commonly associated with higher incidences of many diseases as cardiovascular diseases, type 2 diabetes, breathing difficulties during sleep, certain types of cancer, and osteoarthritis. Thus the current study aimed to study the biological and biochemical changes in cases of obesity and hyperlipidemia in human and animal; in relation to serum appetite related hormones, blood glucose, lipids profile and risk factor as well as the oxidative stress status. Moreover, the hepatic lipids content and the microscopical examination of liver and panaceas sections in hamster.

To achieve these objectives, the present study included the following measurements in the two sections:

Section 1: Human experiment

1. Anthropometric measurements:

Including measurements of body weight, body mass index (MBI) and body fat mass (BFM) in human subjects.

2. Biochemical measurements:

2.1. Serum measurements:

Including, the determination of glucose concentration, insulin concentration, insulin resistance (IR), adiponectin concentration, leptin concentration, ghrelin concentration as well as determination of lipids profile concentrations.

2.2. Erythrocytes measurements:

Including, the determination of superoxide dismutase activity, catalase activity, glutathione peroxidase activity and determination of reduced glutathione concentration.

Section 2: Animal experiment

1. Biological measurements:

Including measurements of final body weight, food intake, feed efficiency ratio (FER), weight of liver and relative weight of liver in hamsters.

2. Biochemical measurements:

2.1. Serum measurements:

Including, the determination of glucose concentration, insulin concentration, insulin resistance (IR), adiponectin concentration, leptin concentration, ghrelin concentration as well as determination of lipids profile concentrations.

2.2. Erythrocytes measurements:

Including, the determination of superoxide dismutase activity, catalase activity, glutathione peroxidase activity and determination of reduced glutathione concentration.

2.3. Liver measurements:

Including, the determination of hepatic total lipids concentration, hepatic total cholesterol concentration and hepatic triacylglycerols concentration.

3. Microscopical examination of liver and pancreas sections.

Appendix

1- Sample menu for 1500kcal

Breakfast:

-Half loaf of balady bread + {cooked beans (medames) (60g) with 1teaspoon oil or cottage cheese (60g) or 1egg (medium}

-Vegetable A: garden rocket, parsley, tomatoes (1small), cucumber, carrots or lettuce

-1 cup of skim milk

Snack:

-1cup (200-240ml) fresh orange juice with carrot

Lunch:

-3/4 loaf of balady bread or (3 tablespoons of rice, macaroni or potatoes)

- 1 serving of green salad (150-200g)

- 1serving of boiled vegetables (180-200g) consist of {squash+ carrot+ green peas+ and potatoes} with 2 teaspoon oil+ lemon juice

- 2 oz (60g) of boiled meat or 1/4 chicken or fish (1 medium)

Snack:

-2 fruits exchanges of {orange, pear (1 small), plums (2medium), peach (1 medium), apricots (2 medium) or strawberries (1 cup)}.

Dinner:

- 1 cup of skim milk or 1 cup of yoghurt
- one fruit exchange as described above
- Cottage cheese (30g)
- 1/4 loaf of balady bread