# Biochemical Studies of Ghrelin and Leptin Levels in Obese Conditions with Body Mass Index and Insulin Resistance

**Presented by**

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**In Partial Fulfillment of the**
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**the Degree of**
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**APROVAL SHEET FOR SUBMISSION**

**Title of the M.Sc thesis: Biochemical studies of ghrelin and leptin levels in obese individuals with body mass index and insulin resistance.**

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| **8. Proteomics** | **16. Industrial Microbiology** | |

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# ABSTRACT

**Name : Hamed Mohamed Hamed Khalil Abou Ismael**

**Title of Thesis: Biochemical studies of ghrelin and leptin levels in obese individuals relationship with body mass index and insulin resistance**

**Degree: M.Sc. of Science in Biochemistry, Chemistry Department, Faculty of Science, Cairo University, 2010.**

## Abstract:

**This study aimed to investigate the levels of some common orexigenic agents and obesity. We focused on some human hormones such as ghrelin, leptin and insulin resistance in serum of over-weight, obese and normal weight Egyptian females.**

**Results: The level of serum human ghrelin hormone was significant decreased in both over-weight and obese individuals as compared with normal weight individuals . Regarding to the level of serum leptin hormone was a highly significant raise in obese individuals while in over-weight individuals we found a slightly decreased as compared with normal weight individuals . Our laboratory data revealed a significant elevation of the level insulin resistance in obese group, but in case of over-weight group a slightly decreased was obtained.**

**Conclusion: Evaluation of the levels of serum ghrelin, leptin and insulin resistance are good markers of the amount of body fat in obese and over-weight individuals .**

**Key words : Ghrelin, Leptin, Insulin resistance, Obesity.**

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| **BMI** | **: Body Mass Index** |
| **CNS** | **: central nervous system** |
| **PVN** | **: paraventricular nucleus** |
| **SNS** | **: sympathetic nervous system** |
| **FFAs** | **: free fatty acids** |
| **NIDDM** | **: Non-Insulin Dependent Diabetes Mellitus** |
| **TG** | **: triglycerides** |
| **WHO** | **:World Health Organization** |
| **GD** | **: gallstone disease** |
| **VMH** | **: ventromedial hypothalamus** |
| **PVN** | **: Paraventricular nucleus** |
| **MC4-R** | **: melanocortin 4 receptor** |
| **SNS** | **:Sympathetic nervous system** |
| **GH** | **: growth hormone** |
| **GHS-R** | **: growth hormone secretagogue-receptor** |
| **GHRL** | **: Ghrelin hormone** |
| **PRL** | **:Prolactine hormone** |
| **ACTH** | **:Adreno corticotropic hormone** |
| **PVN** | **: paraventricular nuclei** |
| **GTT** | **:Glucose tolerance tests** |
| **HIV** | **: human immunodeficiency virus** |
| **ELISA** | **: enzymelinked immunosorbent assay** |
| **G-CSF** | **: granulocyte colony-stimulating factor** |
| **LIF** | **: leukocyte inhibitory factor** |
| **IL-6** | **: interleukin-6** |
| **hGH** | **: human growth hormone** |
| **LEPR** | **: human leptin receptor** |
| **OB-R** | **: OB receptor** |

**NPY** : Neuropeptide Y

**ob** : obesity gene

**icv** : intra-cerebro-ventricularly

**FFA** : free fatty acid

**HDL-C** : HDL-cholesterol

**LDL-C** : LDL-cholesterol

**HDL** : High-density lipoprotein

**LDL** : Low- density lipoprotein

**VLDL** : very low density lipoprotein

**POMC** :Proopiomelanocortin

**IDL** : intermediate density lipoproteins

**CVD** : cardiovascular disease

**SA-HRP** : streptavidin-horseradish peroxidase

**TMB** : tetramethylbenzidine

**HCL** : hydrogen chloride

**APS** : Acetate plate sealer

**IR** : Insulin resistance

**HOMA-IR** : homeostasis model assessment

**MAbs** : monoclonal antibodies

**E2** : estradiol

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## I.1.Definition of Obesity

**Obesity is often defined simply as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired (WHO, Obesity, 2000). Obesity is defined medically as a state of increased body weight, more specifically adipose tissue, of sufficient magnitude to produce adverse health consequences (Spiegelman and Flier, 2001). However, obese individuals differ not only according to the degree of excess fat, which they store, but also in the regional distribution of the fat within the body. Indeed, excess abdominal fat is as great a risk factor for disease as is excess body fat per se WHO (World Health Organization, 1998). Human obesity is associated with many significant comorbidit , including cardiovascular disease, diabetes mellitus, hypertension, stroke, osteoarthritis, and some cancers, gallstone disease (GD), etc. (Mantzoros, 1999).**

## I.2. Classification of Overweight and Obesity

**One of the most commonly used indices of relative weight is the Body Mass Index (BMI), which is defined as body weight in kilogram divided by height, in meters squared. It was not originally intended as an index of obesity but is now commonly employed as such in epidemiological studies, to predict obesity-related morbidity and mortality in adults. A BMI of 30 kg/m ² is considered the threshold of obesity. BMI however does not distinguish between weight associated with muscle and weight associated with fat.**

**BMI can be considered to provide the most useful, albeit crude, population-level measure of obesity. The classification of overweight and obesity in adults as proposed by WHO (World Health Organization, 1998) (Table1).**

**(Table 1): Classification of weight status in adults according to Body Mass Index (BMI) (WHO, 1998)**

| Classification | BMI (kg/m2) | Risk of co-morbidities |
|---|---|---|
| Underweight | < 18.5 | Low (but risk of other clinical problems increased |
| Normal range | 18.5 – 24.9 | Average |
| Overweight: | ≥ 25 | Increased |
| Pre-obese | 25 – 29.9 | Moderate |
| Obese class I | 30.0 – 34.9 | Severe |
| Obese class II | 35.0 – 39.9 | Very severe |
| Obese class III | ≥ 40.0 | |