**Obat: Jurnal Riset Ilmu Farmasi dan Kesehatan**
**Volume. 2 No. 5 September 2024**
e-ISSN : 3031-0148, dan p-ISSN : 3031-013X, Page. 68-76
DOI: https://doi.org/10.61132/obat.v2i5.644
*Available online at: https://journal.arikesi.or.id/index.php/OBAT*

# Estimation Of Tenascin-X, Sphingosine and HOMA-IR Cut-Off Values For Obese Adults

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***Abstract.****Tenascins are glycoproteins groups found in the extra-cellular matrix . The sphingolipidome in blood distinguished as a hundreds types of fats with many different essential chemical and physical properties. Insulin resistance is impaired biologic response of many target tissues to stimulation of insulin, and all tissues that have insulin receptors exposed insulin resistant. Materials and methods: Sixty sampling were participated, their ages ranged from (30-38) years. Biochemical measurements: insulin by AFIAS-10 , TN-X and sphingosine measured by kits by Sun Long Biotech – China. Results:- the level of Tenascin-X, sphingosine and HOMA-IR in the obese group increase significantly (P<0.01) when compared to non-obese group. Cut-off for Tenascin-X was 10.382pg./ml, for sphingosine was 10.93 ng./ml, and for HOMA-IR was 1.43 ng./ml. Conclusions: tenascin-X sphingosine and HOMA-IR were related with obesity. Tenascin-X, Sphingosine and HOMA-IR were related to obesity*

***Keywords :*** *Tenascin-X, Sphingosine , HOMA-IR, Cut-off.*

**Abstrak.**Tenascins merupakan gugus glikoprotein yang terdapat pada matriks ekstraseluler. Sphingolipidome dalam darah dibedakan menjadi ratusan jenis lemak dengan banyak sifat kimia dan fisik penting yang berbeda. Resistensi insulin adalah gangguan respon biologis dari banyak jaringan target terhadap rangsangan insulin, dan semua jaringan yang memiliki reseptor insulin terkena resistensi insulin. Bahan dan Metode: Sampel diambil sebanyak 60 orang, rentang usia (30-38) tahun. Pengukuran biokimia: insulin dengan AFIAS-10 , TN-X dan sphingosine diukur dengan peralatan dari Sun Long Biotech – Tiongkok. Hasil: - Kadar Tenascin-X, sphingosine dan HOMA-IR pada kelompok obesitas meningkat secara signifikan (P<0,01) bila dibandingkan dengan kelompok non obesitas. Batas untuk Tenascin-X adalah 10,382pg./ml, untuk sphingosine adalah 10,93 ng./ml, dan untuk HOMA-IR adalah 1,43 ng./ml. Kesimpulan: sphingosine tenascin-X dan HOMA-IR berhubungan dengan obesitas. Tenascin-X, Sphingosine dan HOMA-IR berhubungan dengan obesitas

**Kata Kunci :** Tenascin-X, Sphingosine, HOMA-IR, Cut-off.

## 1. INTRODUCTIONS

Tenascins are a group of glycoproteins that compose in the extracellular matrix (ECM) and have specific expression patterns in many organs and tissues in different stages during development, homeostasis and upon infection or diseases (1). Tenascin-X (TN-X) is a 450-kiloDalton glycoprotein found in connective tissues, also well-known as hexabrachion-like pro or flexillin. Its apart of the tenascin family. In humans, it is encoded by the TN-XB gene. Tenascin-X is expressed and consistently present in adult tissues including : fibrous connective tissue (ligaments), tendons (sinew), skin, optic nerves, kidneys, adrenal glands, lungs, mammary, ovaries , testis and blood vessels. It is also exist in several parts of the human digestive system, including : pancreatic gland, colon, jejunum, stomach and small intestine (2),(3).

*Received:Juli 02, 2024; Revised:Juli 16, 2024; Accepted:Agustus 10,2024; Online Available:Agustus 12, 2024;*

Sphingolipidome is distinguished as a hundreds of types fats with different essential chemical and physical properties. Sphingolipids, being structural constituents of the lipid double layer (bi-layer), and also sphingolipids are bioactive compounds that present in programmed death/apoptosis, senescence, differentiation cells, inflammatory responses, or autophagy (4). The mysturious character of these lipids has been Spotlight first when their name was given to an entirely new type of fats discovered in 1884 by the J. L. W. Thudichum physician and biochemist German (5), he found in the 1880s, a special bioactive chemical characteristics of "sphingosine", which inspired to named his brain-derived fats-the Sphinx, which is an iconic mythical figure have a human head but a lion body. The distinctive name then known for the sphingolipid classes, but also clearly and explicitly reflects the sphingolipids role or (chimeric function) in the causes of arteriosclerosis or atherosclerosis (6).

The peptidic hormone insulin is biosynthesis, formed and secreted by endocrine beta-cells in pancreas. It has 51 amino acids with molecular weight = 6000 Da in almost all organisms and species, including human. The insulin molecule in human consists of two peptide chains (polypeptide), A chain and B chains that have (21) and (30) aminoacids residues, respectively (7-9). Insulin resistance (IR) refers to the poor response of tissues to insulin stimulation, all tissues that have insulin receptors may be at risk of developing insulin resistance, but the tissues that are the main cause resistance are the hepatocytes, skeletal muscle, and body fat (fat tissue). Impairs glucose handling in IR, leading to over production - hyperinsulinemia (compensatory) (10-12). Homeostasis Model Assessment of Insulin Resistance (HOMA-IR) is a term useful as certified method for IR evaluating (13).

## 2. MATERIALS AND METHODS

Sixty sampling were participated, their ages ranged from 30 to 38 years. They were grouped in to :- 30 from non-obese (control) their BMI was (25±1.1 kg/m$^2$) , and 30 from obese their BMI was (33±2.3 kg/m$^2$). Biochemical measurements of insulin done by AFIAS-10. TN-X and sphingosin were measure using from China's Sun Long Biotech kits. Data Analysis : results analyzed by using quantitative Analysis by XLSTATE program to estimated Student's t-test and the ROC and cut off values.

## 3. RESULTS & DISCUSSION

### a. Tenascin-X

The (mean ± SD) of TN-X ng/ml of non-obese and obese groups levels in the serum were shown in table (1), figure (1) . The results showed the level of TN-X in the obese group increase significantly (P<0.001) when compared to non-obese.

**Table (1): Serum Level of TN-X**

| TN-X ng/ml | | |
|---|---|---|
| **Control** | **Obese** | **P value** |
| **BMI (25±1.1 kg/m$^2$)** | **BMI (33±2.3 kg/m$^2$)** | |
| 3.44± 0.41 | 6.24±0.76 | <0.001 |

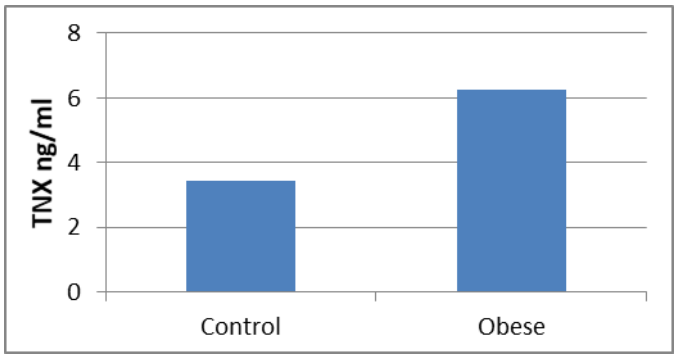


**Figure (1): Serum Level of TN-X**

Receiver operating Characteristics (ROC) curves was used in current research to examine the various biochemical diagnosis for the distribution or disease and determine the optimal limit or threshold. The Area under curve (AUC) is employed as a summary measure of ROC curve. In table (2) and figure (2) : the Sensitivity, specificity , accuracy and 10.382pg/ml cut-off value. A high AUC indicates a close relationship between the TN-X and obesity.

**Table (2): protective value of TN-X**

| Sensitivity | Specificity | Accuracy | AUC | CUT OFF |
|---|---|---|---|---|
| 0.91 | 0.89 | 0.93 | 0.941 | 4.322 |

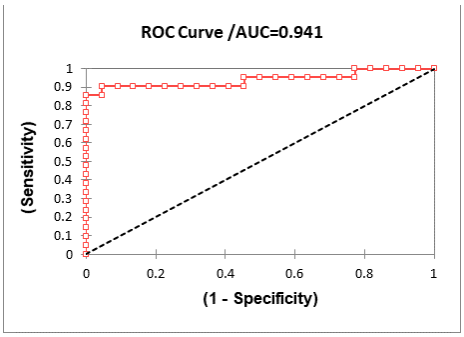


**Figure (2): ROC curves of TN-X**

Tenascin-X have remarkable functions in several pathologies in human. Its expressed in areolar tissue, contributes to the stabilization and maintaining collagen network. Collagen peptide works significantly and effectively to reduce the phenomena associated with obesity that result from following a high-fat food, like accumulation of visceral fat (in the abdomen) and elevated blood glucose, as well as gain obesity. Fish skin-derived collagen peptides intake resulted in significant changes in gut bacteria and is a possible medicinal tool for treating obesity (14),(15), that that in obese people, elevated TN-X levels help to maintain and stabilize collagen. However, tenascins are also dynamically remodeled in a variety of clinical states, including fibrotic disorders, heart disease, and blood vessel disease, and malignant tumor progression (16) , which all are related to obesity (17-20).

**B- Sphingosine**

The (mean ± SD) of sphingosine ng/ml of non-obese and obese groups levels in the serum were shown in table (3), figure (3) . The results showed the level of sphingosine in the obese group increase significantly (P<0.001) when compared to non-obese.

**Table (3): Serum Level of Sphingosine**

| Sphingosine ng/ml | | |
|---|---|---|
| **Control** | **Obese** | **P value** |
| **BMI (25±1.1 kg/m$^2$)** | **BMI (33±2.3 kg/m$^2$)** | |
| 8.32± 0.16 | 12.65±2.51 | <0.001 |

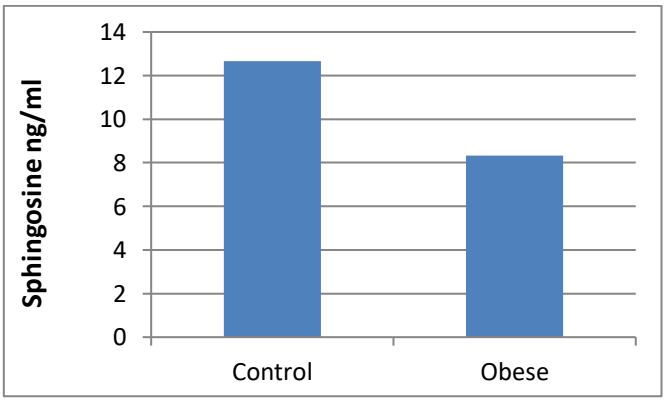


**Figure (3): Serum Level of Sphingosine**

Table (4) and figure (4) shows the Sensitivity, specificity accuracy and 10.93 ng/ml as cut-off value. A high AUC indicates a close that the Sphingosine and obesity are closely related.

**Table (4): protective value of Sphingosine**

| Sensitivity | Specificity | Accuracy | AUC | CUT OFF |
|---|---|---|---|---|
| 0.76 | 0.83 | 0.81 | 0.872 | 10.93 |

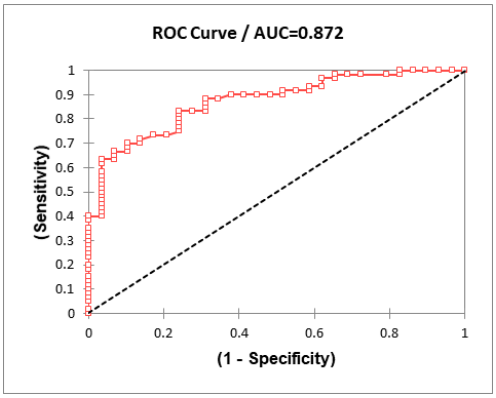


**Table (4): protective value of Sphingosine**

Obesity is a state that considered a chronic low-grade inflammation, adipose tissue work as an endocrine organ by secretes adipokines and chemokines including cytokines pro-inflammatory (21) .Increased blood concentrations of sphingosine and ceramides have been linked to an increased risk of atherosclerotic illnesses, ceramides and sphingosine are regarded as proatherosclerotic sphingolipids (22, 23). Moreover, they have been reported to exhibit proinflammatory (24) and pro-apoptotic activities (25). In the context of metabolism, sphingosine and ceramides are closely related; ceramides hydrolysed to sphingosine, while sphingosine can recycle into ceramides (26). It is not known whether sphingosine is involved in atherosclerosis, but sphingosine has been observed to have apoptotic properties similar to ceramides (27). Furthermore, both type 2 diabetes and obesity have been linked to ceramides and sphingosine, both of which are strong indicators of an increased risk of atherosclerotic diseases (28-30). Therefore, it is possible that ceramides and sphingosines and thier -related modification in diabetes contributes in some way to the atherosclerotic problems and complications frequently seen in diabetes (31).

## C-Insulin & Insulin resistance

The (mean ± SD) of glucose (mg/ml), insulin (ng/ml) and HOMA-IR (U/ml) were listed in table (5) and figure (5). The results: the level of glucose and HOMA-IR increase highly-significant (P<0.05) in the obese, while insulin increased in significant *p* (<0.001) when compared to non-obese.

**Table (5): Level of Glucose, Insulin and HOMA-IR**

| Parameters | Sphingosine ng/ml | | |
|---|---|---|---|
| | Control | Obese | P value |
| | BMI (25±1.1 kg/m$^2$) | BMI (33±2.3 kg/m$^2$) | |
| Glucose (mg/ml) | 95.54± 18.33 | 139.22±33.21 | <0.05 |
| Insulin (ng/ml) | 27.44± 2.01 | 39.76±5.31 | <0.001 |
| HOMA-IR (U/ml) | 1.01± 0.03 | 2.24±0.43 | <0.05 |

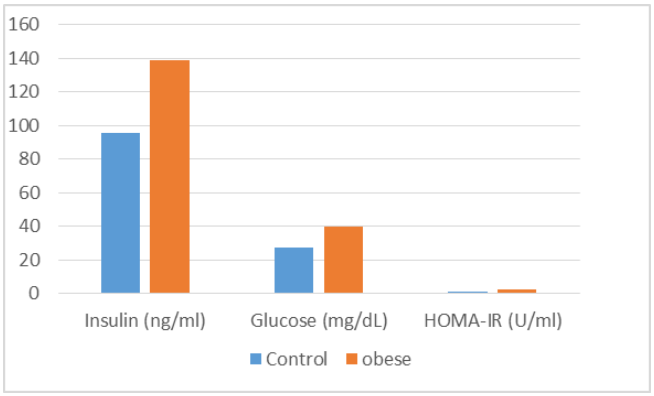


**Table (5): Level of Glucose, Insulin and HOMA-IR**

Table (6) and figure (6) shows the Sensitivity, specificity , accuracy) and 1.43 ng./ml as cut-off value. A high AUC indicates a close that the HOMA-IR and obesity are closely related.

**Table (6): protective value of HOMA-IR**

| Sensitivity | Specificity | Accuracy | AUC | CUT OFF |
|---|---|---|---|---|
| 0.96 | 0.97 | 0.96 | 0.99 | 1.43 |

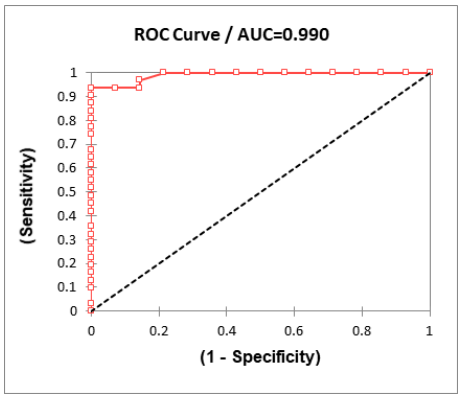


**Table (6): protective value of HOMA-IR**

Insulin resistant is a shared characteristics by dyslipidemia, oxidative stress, inflammation, endothelial dysfunction and cardiovascular disorders (32). These results show that increased fat content and accumulation caused by obesity is the main cause of IR. Numerous theories have been used to explain the mechanism responsible and leads to the development of IR due by increased lipid contents (33). Along with fatty acids, increased adipocytes has been linked to increased production of cytokines (pro-inflammatory), which are thought to be the cause of the development of IR. Therefore, adipose tissues expansibility, or its capacity to store fat, also seems to be important in the development of IR, and this is because, depending on the circumstances, exceeding this capacity would cause fat to leak to other tissues where it could disruption in the insulin signaling (34).

## 4. CONCLUSIONS

This study succeeded in determining cut-off values for the biomarkers tenascin-X, sphingosine, and HOMA-IR in obese adult individuals. These findings provide important insights into biomarker levels that can be used to identify metabolic and cardiovascular health-related risks in obese populations. Establishing these cut-off values has the potential to aid in earlier diagnosis and more effective management of obesity conditions, as well as paving the way for further research to validate and apply these findings in clinical practice.

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