Annals of Case Reports & Reviews

Case Report

doi: 10.39127/2574-5747/ACRR:1000188

Elbossaty WF, et al. Annal Cas Rep Rev: ACRR-188

Metabolic Syndrome (Syndrome X) Causes, Diagnosis, Management and Impairment Thyroid Dysfunction

Walaa Fikry Elbossaty*

Department of Biochemistry, Faculty of Science, Damietta University, Egypt.

***Corresponding author:** Walaa Fikry Elbossaty, Department of Biochemistry, Faculty of Science, Damietta University, Egypt. Email: walaafikry1985@gmail.com

Citation: Elbossaty WF (2021) Metabolic Syndrome (Syndrome X) Causes, Diagnosis, Management and Impairment Thyroid Dysfunction. Annal Cas Rep Rev: ACRR-188.

Received Date: 01 January 2021; **Accepted Date:** 05 January 2021; **Published Date:** 10 January 2021

Abstract

Metabolic syndrome is a group of risk factors that cause many diseases such as diabetes and heart disease.
There are many risk factors responsible for this syndrome, and the presence of 3 or more of them speeds up the process of predicting different diseases and the speed of treatment.
In addition to the nature of food and daily activity, metabolic syndrome has hormonal and non-hormonal causes. Among the hormonal causes is an imbalance in some hormones, especially thyroid hormones.
Where the majority of scientific studies have proven that the increased activity of TSH, a hormone secreted by the pituitary gland and stimulates the secretion of thyroid hormones, inhibits the process of metabolism and then leads to the accumulation of many substances, especially sugar, and this explains the close relationship between thyroid dysfunction and diabetes. The correct diagnosis may be the reason for developing a fruitful treatment strategy that addresses this hormonal error, so that will be a reason to get rid of excess glucose and eliminate diabetes, and this is what will be presented in this review.

Keywords: *Metabolic syndrome; Thyroid dysfunction; TSH; Diabetes mellitus type II*

Introduction

Metabolic syndrome is classified as a disease that includes many risk factors for diabetes and heart disease [1]. These factors include belly fat, especially in the waist area, high triglycerides, low levels of good cholesterol, high blood pressure, and high blood sugar. It is sufficient to classify this syndrome a meeting of at least three factors [2]. The causes that cause metabolic syndrome are obesity, lack of exercise, aging, insulin resistance, and inflammation [3]. The degree of infection with this syndrome varies, as the rate of infection increases in Americans, followed by whites and then blacks. In patients with diabetes or those with a family history of diabetes, compared to those without. In women than male, rates are higher for those who use drugs to gain weight. Diagnosis of metabolic syndrome according to the following table1[4].

Risk factor	Gender	
	Male	Female
International Diabetes Federation (IDF)		
A large waistline	≥ 40 inches	≥ 35 inches
triglyceride level	≥ 150mg/dL	
HDL cholesterol level	≤ 40 mg/dL	≤ 50 mg/dL
High blood pressure	≥130/85 mmHg	
high fasting blood sugar	≥ 100 mg/dL	
World Health Organization (WHO)		
Blood pressure	≥ 140/90 mmHg	

Dyslipidemia	triglycerides (TG) ≥ 1.695 mmol/L and HDL cholesterol ≤ 0.9 mmol/L (male), ≤ 1.0 mmol/L (female)	
Central obesity	waist: hip ratio > 0.90	waist: hip ratio > 0.85
Microalbuminuria	urinary albumin excretion ratio ≥ 20 µg/min or albumin: creatinine ratio ≥ 30 mg/g	
European Group for the Study of Insulin Resistance (EGIR)		
Central obesity	waist circumference ≥ 37 inch	waist circumference ≥ 31.5 inch
Dyslipidemia	TG ≥ 2.0 mmol/L and/or HDL-C < 1.0 mmol/L	
Blood pressure	≥ 140/90 mmHg	
Fasting plasma glucose	≥ 6.1 mmol/L	
National Cholesterol Education Program (NCEP)		
Central obesity	waist circumference ≥ 40 inch	waist circumference ≥ 35 inch
Dyslipidemia	TG ≥ 1.7 mmol/L , HDL-C < 40 mg/dL (male), < 50 mg/dL (female)	
Blood pressure	≥ 130/85 mmHg	
Fasting plasma glucose	≥ 6.1 mmol/L	
American Heart Association		
Central obesity	waist circumference ≥ 40 inch	waist circumference ≥ 35 inch
Dyslipidemia	TG ≥ 1.7 mmol/L , HDL-C < 40 mg/dL (male), < 50 mg/dL (female)	
Blood pressure	≥ 130/85 mmHg	
Fasting plasma glucose	≥ 5.6 mmol/L	

Table 1: Diagnosis system of metabolic disorders.

Metabolic syndrome can be treated by changing and improving the diet by keeping away from trans fats, less carbohydrates and sugars, more fresh vegetables and fruits, and less animal protein Exercising regularly, especially walking for at least 30 minutes every day. For stress and tension, quit smoking [5].

Pathophysiology of metabolic disorders

One of the risk factors for metabolic syndrome is visceral fat, especially around the abdomen, and the presence of these fats increases the rate of inflammation and thus increases the rates of TNF-α, adiponectin, resistin, and PAI-1, Fig.1 [6].

TNF-α produces inflammatory cytokines through its association with TNF-α receptor, and this link increases insulin resistance [7].

Studies have shown that mice fed on sucrose increases the incidence of metabolic syndrome, due to the fact that sugar intake increases internal fats, which in turn increases insulin resistance [8].

There is also another mechanism in that the increase in fat cells increases the immune cells and thus the rate of inflammation increases, which helps in high blood pressure, lipids and diabetes [9].

Eating high-fat meals, especially Arachidonic acid (with its precursor - linoleic acid) increases inflammatory media known as eicosanoids through arachidonic acid-containing compound diacylglycerol (DAG) is a precursor to the endocannabinoid 2-arachidonoylglycerol (2-AG). Fatty acid amide hydrolase (FAAH) mediates the metabolism of anandamide into arachidonic acid. Anandamide and 2-AG can also be hydrolized into arachidonic acid, potentially leading to increased eicosanoid synthesis [10].

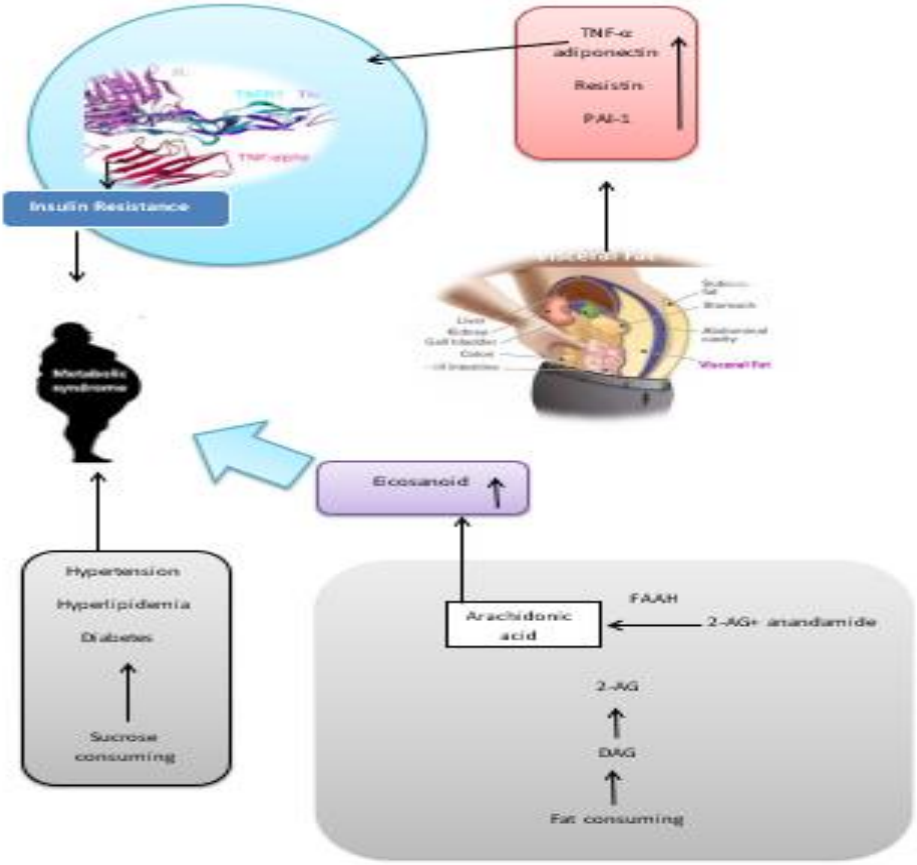

Figure 1: Pathophysiology of metabolic syndrome

Interaction between thyroid dysfunction and metabolic syndrome

There is a relationship between metabolic syndrome and hormonal activity, as it was found that there is a relationship between the syndrome and thyroid hormones [11].

Studies have shown that most patients suffering from metabolic syndrome also suffer from an underactive thyroid gland, and both of them have an effective role in developing heart disease [12].

There is also a strong relationship between metabolic syndrome and thyroid dysfunction due to the direct effect of thyroid hormones on fat and glucose metabolism [13].

Where the condition called subclinical thyrodism is known as the high hormone TSH, which plays an important role in carbohydrate and fat metabolism. If the BMI rate increases, we find that this is an indication of an increase in the proportion of fat, especially in the waist area, and the accumulation of fat cells affects the activity of the thyroid gland and then its hormones, which causes metabolic syndrome [14].

Where it was found that most people who suffer from type 2 diabetes have an imbalance in the activity of the thyroid gland, in which case they become lethargic in the activity of the gland due to the fat cells, which resist the action of metabolism hormones, which contributes to the accumulation of fat and high glucose in the blood [15].

Conclusion

There are many causes of metabolic syndrome, as there are many diseases associated with this syndrome, such as diabetes, especially type 2 diabetes, high blood pressure, and excess lipids in the blood.

However, among these reasons, there is an imbalance in the hormonal system, especially the thyroid gland, whose hormones are responsible for metabolic processes, as the presence of any defect significantly affects metabolic syndrome.

There is a condition known as subclinical thyrodism and this condition is diagnosed with an elevated TSH with the fall of the hormone FT3 and FT4 in its normal levels.

The high TSH increases the accumulation of sugar and fats in the blood and increases the cells' resistance to insulin, which leads to a large number of metabolic syndrome.

Therefore, patients with metabolic syndrome must check thyroid hormones and monitor their activity from failure, obtain appropriate treatment, exercise, eat healthy food, and keep away from carbohydrates and sugars in order to

reduce the risks of the syndrome and prevent diabetes, high blood pressure and fats.

Funding: No funding for this research

Conflict of interest: The authors declare that they have no conflict of interests.

References

1. Kaur J. "A comprehensive review on metabolic syndrome". Cardiology Research and Practice.2014; 2014: 1–21.
2. Omaima A, Hewaida M, Safaa A. Epidemiology of metabolic syndrome in Menoufia University students. Menoufia Med J. 2018;31:839-45.
3. Christian K, Andrea L, James B. Metabolic Syndrome and Insulin Resistance: Underlying Causes and Modification by Exercise Training. Compr Physiol. 2013 Jan; 3(1): 1–58.
4. Paul L. A comprehensive definition for metabolic syndrome. Dis Model Mech. 2009 May-Jun; 2(5-6): 231–237.
5. Binesh M, Adeli K. Pharmacological management of metabolic syndrome and its lipid complications . Daru. 2010; 18(3): 146–154.
6. Manuel F, Carlota T, Víctor V. Relevance of Leptin and Other Adipokines in Obesity-Associated
7. Cardiovascular Risk. Nutrients. 2019 Nov; 11(11): 2664.
8. Stephen E . The role of TNF-alpha in insulin resistance. Endocrine.2004; 23(2-3):177-82.
9. James M, Theodore J. Sucrose, High-Fructose Corn Syrup, and Fructose, Their Metabolism and Potential Health Effects: What Do We Really Know. Adv Nutr. 2013; 4(2): 236–245.
10. Sotirios T, Alexios S, Evangelos O, George-Aggelos P. The Role of Inflammation in Diabetes: Current Concepts and Future Perspectives. Eur Cardiol. 2019; 14(1): 50–59.
11. Kazuhito T, Toru U, Yasuo O. Endocannabinoids and related N-acylethanolamines: biological activities and metabolism. Inflamm Regen. 2018; 38: 28.
12. Alexander I, Erich S, Georg B. Thyroid Hormones and the Metabolic Syndrome. Eur Thyroid J. 2013; 2(2): 83–92.
13. Rashmi M, Yan-Yun L, Gregory A. Thyroid Hormone Regulation of Metabolism. Physiol Rev. 2014; 94(2): 355–382.
14. Patrícia F, Santos T, Patrícia B. The role of thyroid hormone in metabolism and metabolic syndrome.Ther Adv Endocrinol Metab. 2020; 11: 2042018820917869.
15. Debmalya S, Moutusi R. Hypothyroidism and obesity: An intriguing link. Indian J Endocrinol Metab. 2016; 20(4): 554–557.
16. Rashmi M, Yan-Yun L, Gregory A. Thyroid Hormone Regulation of Metabolism. Physiol Rev. 2014; 94(2): 355–382.