Association of hypothyroidism with metabolic syndrome - A case-control study

Peer review status:
No

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Article ID: WMC004789
Article Type: Research articles
Submitted on: 29-Dec-2014, 11:04:57 AM GMT  Published on: 29-Dec-2014, 11:08:34 AM GMT
Article URL: http://www.webmedcentral.com/article_view/4789
Subject Categories: ENDOCRINOLOGY
Keywords: Metabolic Syndrome

How to cite the article: Karanth VK, Karanth S, Karanth T, Naha K. Association of hypothyroidism with metabolic syndrome - A case-control study. WebmedCentral ENDocrinology 2014;5(12):WMC004789

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Source(s) of Funding:
No funding source

Competing Interests:
No competing interests
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Introduction

Metabolic syndrome is a combination of medical disorders that, when occurring together, increase the risk of developing cardiovascular disease and diabetes\(^1\). According to the International Diabetes Federation (IDF), central obesity and insulin resistance form the prerequisites of metabolic syndrome.

The metabolic syndrome is defined by the IDF as follows:

- Central obesity (defined as waist circumference\(^*\) with ethnicity-specific values) AND any two of the following:
  - Raised triglycerides: >150 mg/dL (1.7 mmol/L), or specific treatment for this lipid abnormality
  - Reduced HDL cholesterol: <40 mg/dL (1.03 mmol/L) in males, <50 mg/dL (1.29 mmol/L) in females, or specific treatment for this lipid abnormality
  - Raised blood pressure (BP): systolic BP >130 or diastolic BP >85 mm Hg, or treatment of previously diagnosed hypertension
  - Raised fasting plasma glucose (FPG): >100 mg/dL (5.6 mmol/L), or previously diagnosed type 2 diabetes

\(^*\) If BMI is >30 kg/m\(^2\), central obesity can be assumed and waist circumference does not need to be measured\(^2\).

Hypothyroidism causes the slowing of metabolic processes and hence reduces the rate of insulin production which predisposes the patient to diabetes\(^3\). It is also known to produce thickening of arterial wall (atherosclerosis) and myocardial infarction\(^4\), and is frequently associated with hypertriglyceridemia. Nevertheless, hypothyroidism, overt or subclinical, is not considered as a component of the metabolic syndrome.

Aim

To determine whether TSH level can be included in the criteria of metabolic syndrome and whether patients with metabolic syndrome should be screened for the presence of hypothyroidism.

Objectives

The objective of this study is to find out whether an association exists between hypothyroidism and the metabolic syndrome.

Methodology

We did a case control study from the data collected from patients admitted to the medicine department of our tertiary teaching hospital after obtaining consent from institutional ethical committee. Within a period of two months, TSH estimation was done for forty two admitted patients. We obtained a consent from these patients for retrieving data from files and for measuring the waist circumference. After noting the patient particulars and recording their vital signs, we recorded their investigation results. We entered the patient details such as registration number, age, gender, religion, height, weight, BMI, Blood pressure, fasting plasma glucose, TSH, triglycerides and HDL Cholesterol in a standard chart prepared before starting the study and measured the waist circumference. Four patients, two men and two women were admitted to the intensive care unit and were critically ill, hence we excluded them from the study.

Results

The 38 patients were between 21 to 80 years of age. There were 22 men and 16 women.

Seventeen patients had normal waist circumference. The cut off was 102 cms for men and 89 cms for women. 21 patients were obese with larger waist circumferences. We analysed their data for the other criteria of metabolic syndrome. Ten patients had both diabetes mellitus and hypertension, 2 had hypertension and 13 had diabetes alone. Only one patient with normal waist circumference had three other deranged parameters. He was a diabetic with fasting blood sugar of 252 mg/dL, raised triglycerides, 766 mg/dL and reduced HDL cholesterol of 7 mg/dL. He also had high TSH levels.

Five patients of the 21 obese patients did not meet the other two criteria and were not included in the
metabolic syndrome. Illustration 1. We noted that TSH was high in 24 patients, high normal in 7 and normal in 11 patients. All the four critically ill patients who were excluded from the study and the patient with dyslipidemia had very high TSH values. Seven of the 16 patients with metabolic syndrome and 12 of the 22 normal patients had high TSH values Illustration 2.

The data was analysed statistically using SPSS software.

Though the initial number of 42 was robust, the patients meeting the criteria of metabolic syndrome were only 16, and hence the analysis does not have much statistical power.

However, a very interesting fact was evident while analyzing this study. There were initially 21 patients with large waist circumference. Five patients did not meet the other criteria for metabolic syndrome, and 4 of them had normal TSH. Only one patient with high TSH did not meet the other criteria for metabolic syndrome. Illustration 3

Conclusions

In a patient who is obese with a larger than normal waist circumference, if his TSH is high, he is more likely to be suffering from metabolic syndrome and, if the other criteria are analysed, it is more likely that they will be out of normal range than if the TSH levels were within normal range.

Discussion

Metabolic syndrome is a derangement in the energy and storage mechanisms within the body. The thyroid hormone is closely related to regulation of basal metabolic rate and, is but natural to be associated with this syndrome. However, the criteria put forth by various organisations International Diabetes Federation, World Health Organisation, do not include TSH level estimation as one of the criteria. An attempt has been made to analyse from this perspective.

This study used the starting point as the TSH level estimation in patients admitted for various ailments or illnesses. Hence the non- metabolic syndrome group does not represent the healthy community population. However, an attempt has been made to find a co-relation with the metabolic syndrome and overt or subclinical hypothyroidism. This study has concluded that if a patient is obese and has a high TSH level, it is more likely that his other parameters defining metabolic syndrome will be deranged.

Our findings correlate with earlier studies which have found that TSH in the upper normal range have associated obesity, higher triglyceride levels and are more likely to be affected by this syndrome. (5)

References

(3) Brenta G. Why can insulin resistance be a natural consequence of thyroid dysfunction? J Thyroid Res. 2011;2011:152850.
(5) Ruhla S Weickert MO et al. A high normal TSH is associated with the metabolic syndrome. Clin Endocrinol (Oxf) 2010 May; 72(5): 696-701

Authors Contribution(s)

Dr. Veena K Karanth, Ms Sowmyashree Kota Karanth, Ms. Tulasi Kota Karanth and Dr. Kushal Naha have actively participated in conceptualising, collecting the data analysing and preparing the manuscript.
Illustrations

Illustration 1

Patient flow chart

Illustration 2

TSH level and patient condition

<table>
<thead>
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<th>TSH levels</th>
<th>Normal</th>
<th>Metabolic Syndrome</th>
<th>Critically Ill</th>
<th>Dyslipemia</th>
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<td>7</td>
<td>4</td>
<td>1</td>
</tr>
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<td>Nil</td>
</tr>
<tr>
<td>Normal</td>
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<td>7</td>
<td>Nil</td>
<td>Nil</td>
</tr>
</tbody>
</table>
Illustration 3

TSH and Metabolic Syndrome

<table>
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<tr>
<th>TSH Level</th>
<th>Increased waist circumference</th>
<th>Metabolic syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Normal</td>
<td>13</td>
<td>9</td>
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</tbody>
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