Research Article

The Correlation between Serum Inositol 1,4,5 Triphosphate Level and Primary Hypothyroidism

Akram Sabah Mutashar, Maysaa Jalal Majeed, Mohamed Sadoon Mohson

1 Department of Chemistry, College of Medicine, University of Baghdad. Baghdad, Iraq
2 Baghdad Centre for Therapy Radiation and Nuclear Medicine, Medical City Complex, Baghdad, Iraq
*Corresponding author: akram.chemist2582@gmail.com

ABSTRACT

Background: Most primary hypothyroidism patients also experience inefficiency and irregularity. It is possible to understand the significance of myo-inositol in treating the thyroid gland by relating it to the synthesis of thyroid hormones. Study aimed to estimate serum of inositol 1,4,5-triphosphate (IP3) in primary hypothyroidism disorder and through that level it can shed light on whether it is accused of inactivity of the thyroid gland and at the same time open the doors for the use as a treatment.

Subject and Methods: The study was taken from the analytical cross-sectional design. 120 subjects were divided into three groups, the first group included 40 healthy subjects, the second group included 25 patients with subclinical hypothyroidism, and the last group had 55 patients with primary hypothyroidism. with the subjects chosen from a teaching laboratory in the medical city. thyroid hormones and serum TSH was determined using Enzyme Immunoassay by Tosoh instrument assay, while serum inositol 1,4,5-triphosphate (IP3) using (ELISA) system.

Results: primary hypothyroidism patients showed a significant (p≤0.05) decrease level of serum IP3 when compared with healthy subjects. There is significant positive correlation with serum inositol 1,4,5 triphosphate (IP3) and each triiodothyronine S.T3 (r = 0.581, p ≤0.05), thyroxine S.T4 (r = 0.597, p ≤0.05), and significant negative correlation thyroid-stimulating hormone S.TSH (r=−0.820, p≤0.05), in primary hypothyroidism Patients.

Conclusions: inositol 1,4,5 triphosphate (IP3) deficiency in primary hypothyroidism disorder may be a cause of it happening, at the same time may be useful in its treatment even if it was not studied adequately in the study, but through its effect on a thyroid hormone.

Introduction

Primary Hypothyroidism is a condition in which the thyroid gland does not produce enough thyroid hormone to meet the body's needs for regulating metabolism and energy utilization. It affects practically every organ in the body. (1)

A rise in blood TSH with normal thyroxine (T4) and triiodothyronine (T3) concentrations in the first biochemical anomaly in primary hypothyroidism (i.e., subclinical hypothyroidism). (2)

Phosphoinositide is part of the phosphatidylinositol signal transduction channel across the plasma membrane via the second
Inositol is a key component of cell structure and metabolism.

**Messengers:**

- **Inositol 1,4,5-triphosphate (IP3):** Acts as a second messenger for various hormones.
- **Phosphatidylinositol 4,5-bisphosphate (PIP2):** Precursor for signaling.
- **Insulin:** Key in metabolic pathways.

**Roles in Metabolism:**

- **Glucose Metabolism:** Hexokinase converts glucose to glucose-6-phosphate.
- **Thyroid Hormones:** Inositol affects secretion, hormone storage, and signaling.
- **Signal Transduction:** Phospholipids as precursors.

**Inositol Derivatives:**

- **MYO Inositol:** Essential dietary component.
- **Phospholipids:** Precursors for signaling.

**Inositol Homeostasis:**

1. **Absorption:** In the jejunum and duodenum.
2. **Transport:** Sodium-dependent transporters.
3. **Storage:** In intracellular stores.

**Inositol's Structural Roles:**

- **Structural Lipids:** Essential for cell function.
- **Cell Proliferation:** Regulates morphology.

**Study Design:**

1. **Clinical Hypothyroidism:**
   - **Group:** Subclinical hypothyroidism.
   - **Method:** Measured serum levels of IP3.
2. **Results:**
   - Significant decrease in IP3 levels in subclinical hypothyroidism.
   - Correlation with TSH levels.

**Conclusion:**

Inositol's role in thyroid hormone signaling is crucial, and its levels can be dysregulated in hypothyroidism.

**References:**

1. Al-Kindy, College Medical Journal 2022:18 (3)
2. Kindy College Medical Journal
3. [https://jkmc.uobaghdad.edu.iq/](https://jkmc.uobaghdad.edu.iq/)
Table 1: Mean ± Standard deviation SD of Age and sex number in healthy, subclinical subjects and hypothyroidism patients

<table>
<thead>
<tr>
<th>Studied parameter</th>
<th>Studied groups</th>
<th>Mean ±SD</th>
<th>P-Value</th>
<th>LSD P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Healthy subject (A) NO.40</td>
<td>42.38 ±12.26</td>
<td>AVS B P&gt;0.05</td>
<td>N.Sig. A VS C P&gt;0.05 N.Sig. B VS C</td>
</tr>
<tr>
<td></td>
<td>Subclinical Subject(B) NO.25</td>
<td>45.36 ±12.41</td>
<td>P&gt;0.05 N.Sig.</td>
<td>B VS C P&gt;0.05 N.Sig.</td>
</tr>
<tr>
<td></td>
<td>Hypothyroidism Patient (C) NO.55</td>
<td>42.49 ±11.31</td>
<td>B VS C P&gt;0.05 N.Sig.</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Mean ± Standard deviation SD of serum IP3 in primary hypothyroidism patients, Subclinical subjects, and healthy subjects

<table>
<thead>
<tr>
<th>Studied marker</th>
<th>Studied groups</th>
<th>Mean ±SD</th>
<th>P-Value</th>
<th>LSD P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.IP3 (ng/ml)</td>
<td>Healthy subject (A) NO.40</td>
<td>9.16 ±4.72</td>
<td>B VS A P≤0.05</td>
<td>Sig</td>
</tr>
<tr>
<td></td>
<td>Subclinical Subject (B) NO.25</td>
<td>3.40 ±0.72</td>
<td>C VS A P≤0.05</td>
<td>Sig</td>
</tr>
<tr>
<td></td>
<td>Hypothyroidism Patient (C) NO.55</td>
<td>2.02 ±0.57</td>
<td>C VS B P≤0.05</td>
<td>Sig</td>
</tr>
</tbody>
</table>

Figure 1: Mean ± Standard deviation (SD) of S. IP3 in healthy subjects, Subclinical subjects, and primary hypothyroidism patients

Figure 2: Correlation between serum inositol1,4,5 triphosphate (IP3) and S.T3 in primary Hypothyroidism Patients

Figure 3: Correlation between serum inositol1,4,5 triphosphate (IP3) and S.T4 in primary Hypothyroidism Patients
Using receiver operator characteristic analysis (ROC) curve, to examine the diagnostic efficiency of serum IP3 level about primary hypothyroidism Patients. ROC curve is a graphical representation of the relationship/tradeoff between clinical Specificity and Sensitivity for each cut-off test. The results are tabulated in table (3) and figures (5) according to primary hypothyroidism Patients.

Table 3: Sensitivity and Specificity, the area under the curve and Cut-off value of serum IP3 in primary Hypothyroidism Patients

<table>
<thead>
<tr>
<th>parameter</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>AUC</th>
<th>Cut-off value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.IP3</td>
<td>82.5%</td>
<td>100%</td>
<td>0.95</td>
<td>5.25(ng/ml)</td>
</tr>
</tbody>
</table>

Conclusion
A decrease in the level of serum inositol 1,4,5 triphosphate (IP3) may be one of the reasons for the occurrence of the primary hypothyroidism disorder. Through its effect on thyroid hormone, it can suggest its use in the treatment of the thyroid gland.

Funding
This research did not receive any specific fund.

Conflict of Interest
No conflict of interest

References


To cite this article: Mutashar AS, Majeed MJ, Mohson MS. The Correlation between Serum Inositol 1,4,5 Triphosphate Level and Primary Hypothyroidism. Al-Kindy College Medical Journal. 2022;18(3):228–32.