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Study of Insulin Resistance in Female Hypothyroid Patients Attending a Tertiary Care Hospital

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ABSTRACT

Insulin resistance is defined as a glucose homeostasis disorder involving a decreased sensitivity of muscles, adipose tissue, liver and other body tissues to insulin, despite its normal or increased concentration in blood. Insulin resistance may be asymptomatic or occur presenting a variety of disorders, such as: glucose tolerance impairment, type 2 diabetes, as well as hypercholesterolemia, hypertriglyceridemia, obesity and arterial hypertension. Insulin acts via specific receptors present on the surface of most cells of the body. The greatest number of these receptors is found on adipocytes, hepatocytes and striated muscle cells. There are three mechanisms of insulin resistance: pre-receptor, receptor and post-receptor. Multiple methods of assessing insulin resistance are based on the concurrent measurements of glucose and insulin levels in blood serum. The glucose and insulin measurements are conducted in baseline conditions or after intravenous administration of a specific quantity of glucose or insulin. The methods of assessing insulin resistance are divided into direct and indirect. The current 'gold standard' in the assessment of insulin sensitivity is the determination of tissue glucose utilisation using the metabolic clamp technique. The presence of disorders of carbohydrate metabolism has been demonstrated in thyroid disease involving either overt hyperthyroidism or overt hypothyroidism. The severity of the disease is proportional to the severity of these disorders. The possible influence of subclinical forms of both hyperthyroidism and hypothyroidism on carbohydrate disorders is still under discussion. Thyroid hormones have a significant effect on glucose metabolism and the development of insulin resistance. In hyperthyroidism, impaired glucose tolerance may be the result of mainly hepatic insulin resistance, whereas in hypothyroidism the available data suggests that the insulin resistance of peripheral tissues prevails.

INTRODUCTION

Insulin resistance is defined as a glucose homeostasis disorder involving a decrease sensitivity of insulin in muscles, adipose tissue, liver and other body tissue or increased concentration in blood `Insulin resistance may be asymptomatic or occur presenting a variety of disorders such as glucose tolerance impairment, type 2 diabetes, As well as hypercholesterolemia, hyper triglyceridemia, obesity and arterial hypertension. Insulin acts on specific receptors present on the surface of most cells of the body. The greatest number of these receptors is found on adipocytes, hepatocytes and striated muscle cell[1]. Multiple methods of assessing insulin resistance are based on concurrent measurement of glucose and insulin level in serum. Prevalence of hypothyroidism in India 3.9% in adult. prevalence of subclinical hypothyroidism is 9.4%. In women prevalence was higher 11.4% compared with men. 6.2% the association between insulin resistance hypothyroidism. Subclinical hypothyroidism has been associated with elevated cholesterol and increased LDL and decreased HDL which increases risk for atherosclerosis which leads to coronary heart disease[2].

Aim of the Study:

- To assess the insulin resistance in hypothyroid patient compared to healthy control.
- To estimate the thyroid profile for selection of study group.
- To estimate serum insulin level, blood glucose and lipid profile in both group.

MATERIALS AND METHODS

Hospital based observational study to be conducted in medicine and OBG department at BRIMS teaching hospital Bidar. Starts from June 2023 to may 2024 Relevant data will be collected personally by investigator.

Methods of Collection of Data: For the present study After approval and clearance from the institutional ethical committee. For the present study 30 cases of diagnosed hypothyroid will be included from medicine and OBG department at BRIMS teaching hospital Bidar. And 30 control group matched for age and sex will be selected. The cases will be divided into further subgroups.

- Sub clinical hypothyroidism.
- Overt hypothyroidism.

After obtaining the informed consent from the patients, blood samples will be collected from patients and healthy controls and tested for serum insulin TSH, FT3, FT4 and lipid profile. Blood glucose on AU 480 beckman coulter fully automated biochemistry analyser and maglumni 1000 fully automated hormone analyser at biochemistry laboratory, BRIMS teaching hospital bidar.

Methodology and Type of Data Collected:
Patient's Demographic Details:

- Age.
- Sex.
- Employment status.
- Address.
- Contact details.
- Marital status.
- Family status.
- Diagnosis.

Sample Collection: Under strict aseptic condition 5ml of fasting blood sample was collected by venous puncture into properly labeled plain polystyrene tubes for serum insulin, thyroid hormone and lipid profile. The sample were collected, handled and transported to the lab according to the guidelines given by the clinical and laboratory standards institute/ NCCLS[3-5]. (National clinical chemistry laboratory standards) blood samples were centrifuged at 10,000 rpm for 10 mints plasma glucose was estimated within 30minuts. Of sample collection serum TSH, FT3, FT4 were estimated by chemiluminescent immune assay on maglumni 1000 fully automated hormone analyzer. Blood glucose levels were estimated by GOD-POD method serum insulin was estimated by direct chemiluminescence technology.

Inclusion Criteria[4]:

- Patient age between 21-39 years of female sex.
- TSH raised-(0.35-4.95 miu/ltr).
- FT3 and FT4 level decreased.
- Normal FT3-3.8-6.0 pmol/l.
- Normal FT4 9.14-23.81 pmol/l.

Exclusion Criteria[4]:

- Coronary heart disease.
- Diabetes, family history of diabetes mallets.
- Pregnancy, pituitary/hypothalamic disorder.
- Thyroid hormone medication up to 3 months before enrolment.
- Lipid lowering agents within 6 months before enrolment.

Study Sample Size: Total 60, out of which. 30 cases and 30 controls.

Sample Design: Purposive sampling.

Study Design: Case control study.

Study Period: One year (12 months).

Place of Study: BRIMS teaching hospital, Bidar.

Study Population: Patients who are coming to medicine and OBG Department, BRIMS, BIDAR.

Follow up Period: -Nil.

RESULTS AND DISCUSSIONS

Statistical Analysis: All the data analysis was performed using SPSS version 24. The continuous data was reported in mean and SD. The data was compared between groups using Unpaired t test. The statistical significance was fixed at $p \leq 0.05$.

Table 1: Descriptive Data of Study Variables in Group 1

	Minimum	Maximum	Mean	SD
GLUCOSE	50.0	94.80	80.13	7.80
INSULIN	1.20	50.60	16.17	14.32
T3	.50	6.42	1.31	1.02
T4	.28	10.40	7.78	2.51
TSH	1.21	10.20	3.93	2.44
HOMA	1.0	9.6	3.16	2.43

Table 2: Descriptive Data of Study Variables in Group 2

	Minimum	Maximum	Mean	SD
GLUCOSE	76.30	95.00	80.75	4.17
INSULIN	4.00	15.00	7.37	2.33
T3	.50	2.05	1.10	.38
T4	3.50	13.50	9.83	2.54
TSH	.56	6.28	3.51	1.75
HOMA	.6	2.2	1.42	.44

Table 3: Comparison of Study Variables Between Groups

	Group	Mean	SD	P value
GLUCOSE	Group 1	80.13	7.80	0.7
	Group 2	80.75	4.17	
INSULIN	Group 1	16.17	14.32	.002*
	Group 2	7.37	2.33	
T3	Group 1	1.31	1.02	.30
	Group 2	1.11	.38	
T4	Group 1	7.78	2.51	.003*
	Group 2	9.83	2.54	
TSH	Group 1	3.93	2.44	.447
	Group 2	3.51	1.75	
HOMA	Group 1	3.16	2.43	.001*
	Group 2	1.42	.44	

Unpaired t test, *statistical significance at $p \leq 0.05$

Review of Literature:

- A study was conducted in the department of biochemistry G B pant hospital new Delhi patient suffering from subclinical and over hypothyroidism was enrolled in the study demonstrated that hypothyroidism leads to insulin resistance[3].
- Thirty-four women with subclinical hypothyroidism and 20 healthy women as controls were enrolled in this prospective study. Fasting insulin levels, total cholesterol and LDL were higher significantly in sub clinical hypothyroid patient as compared with control group[4].
- George dimitridis *et al.* state that glucose uptake in muscle and adipose tissue is resistant to insulin, suppression of lipolysis by insulin is not impaired, hyper triglyceridemia is due to decreased clearance by the adipose tissue[6].
- Sapna Vyaka ram *et al.* state that SCH associated with higher insulin levels and insulin resistance which correlates positively with TSH levels and negatively with FT3 and FT4[7].

Hasret Cengig *et al.* stated that thyroid hormones affect the activity of many key enzymes in the lipid metabolism, so lipoprotein composition and transport are severely impaired in thyroid disease. Hypothyroidism causes hyper cholesterolemia and elevated LDL levels[8,9].

CONCLUSION

Thyroid hormone have a significant effect on glucose metabolism and the development of insulin resistance. In previous study showed that hypothyroid is glucose uptake in muscleand adipose tissue resistance to insulin.

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