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A STUDY ON RELATIONSHIP BETWEEN HYPOTHYROIDISM AND NON ALCOHOLIC FATTY LIVER DISEASE AMONG OBESE WOMEN IN KOLKATA INTERVENING WITH DIET

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ABSTRACT

Background – Nonalcoholic fatty liver disease nowadays is affecting almost every working man & woman in all cities comparatively more in metro cities & Kolkata is one of the burning examples. The risk is higher than average to obese middle-aged women who are suffering from lifestyles disorders including hypothyroidism. **Aims** -This study aimed to determine whether a relationship exists between Hypothyroidism & NAFLD among the obese working women practicing unhealthy eating habits.

Methods –Total 190 obese nondiabetic, non-alcoholic women had a history SCH to moderate hypothyroidism under the age group 30-40 years located in Kolkata were enrolled for this study for six months with Thyroxin tablet & next six months without this. A qualitative study by purposive sampling method was used applying questionnaires based on socio-demographic data, food-frequency, cooking & eating habits. BMI, thyroid function tests, blood tests reports were incorporated as secondary data. SPSS-version-16 was used as a statistical tool for data analysis & findings.

Results –The study showed that 1st six month, 118 Pre-Obese women were consuming Thyroxine tablets 25mcg & 72 Obese –I participants 50 mcg tablet per day for subclinical hypothyroidism or mild to moderate hypothyroidism due to elevated serum TSH & normal or little low fT_4 . There was a progress of obesity status (4 subjects) & at the same time remarkable progress on hypothyroidism because 48 mild hypothyroid & 18 moderate HT converted from HT state to SCH (better stage) .The Paired-Samples Correlation showed that Hypothyroid Type & NAFLD Fibrosis Score (N.F.S) relationship was significantly positively correlated ($r = 0.305, p < 0.001$). There was a significant average difference between Hypothyroidism & N.F.S [$(t_{189} = 66.07, p < 0.001)$, 95% Confidence Interval 2.859 ,3.035] . p value=.000 which is less than .05 ($p < .001$ or; $P = 0.000$, means- $P < 0.0005$).

Conclusions – Both the stages of six-month studies Hypothyroid Type & N.F.S relationship was significantly positively correlated. Also, as per statistical analysis & interpretation, 2nd six-month stage showed better results for patients on their health status. So, both hypothyroidism & NAFLD significantly positively correlated with BMI & TSH range. This results observed due to tentative follow up hypothyroid diet plan & no consumptions of Gluten ,Goitrogens , Thiocyanates, Flavonoids rich foods.

KEYWORDS: Obesity, NAFLD, Hypothyroidism, Diet, BMI, N.F.S

INTRODUCTION

Thyroid hormones usually regulate the body weight, lipid metabolism & insulin resistance responsible for the pathogenesis of nonalcoholic fatty liver disease (NAFLD) and nonalcoholic steatohepatitis (NASH). As per current studies, the relationship between hypothyroidism and NAFLD are still controversial & under research. The other theory is based on hepatic damage through mitochondrial dysfunction, oxidative stress, and reactive oxygen species (ROS) production. Mitochondria are the principle organelle for oxidative reactions like β -oxidation, and they are the main source of ROS [1]. Patients who are suffering from NAFLD may get benefit from early screening for T2DM, because abnormal glucose metabolism is much higher than the previous state. [2] As per a study, NAFLD is an independent risk factor for impaired fasting glucose and DM-II, showing a stronger impact in Japanese with a lower BMI index. [3] Bariatric surgery can improve hypothyroidism state at post phase & decreasing BMI can also reduce TSH & overall improve the thyroid health [4] Subclinical hypothyroidism associated with mild hyperlipidemia may cause an increased risk of atherosclerosis. As per therapy with L-thyroxine is the primary treatment in patients with both overt and SCH with or without angina, to reduce the cardiovascular risk resulting from dyslipidemia.[5] SCH or mild to moderate hypothyroidism, in the range of upper TSH & normal T4 level could be related to NAFLD in a dose-dependent manner. Hypothyroidism is closely & significantly associated with NAFLD already known metabolic risk factors which confirm an obvious relevant clinical relationship between these two diseases with related comorbidity [6]. As per a study among Chinese, one finding suggested that thyroid function even within the reference range can be associated with NAFLD in elderly women or any person. [7]. A current cross-sectional study suggests that low FT4 concentrations are closely linked with hepatic steatosis. Longitudinal and intervention studies are applied to find out whether any type of hypothyroidism increases the risk of hepatic steatosis or vice versa [8]. In euthyroid patients, high-though-normal TSH values are independently associated with NASH/ NAFLD [9,11]. A simple scoring system accurately distinguishes patients with NAFLD with or without advanced fibrosis, rendering liver biopsy for ensuring the advanced fibrosis unnecessary in a substantial proportion of patients [10,12]. Indian women mostly prone to endocrine disorders mostly hypothyroidism at early or advanced age along with metabolic disorders, such as diabetes type 2, impaired glucose tolerance & obesity which are the gross risk factors for NAFLD [13]. Thyroid hormone abnormalities in patients with NAFLD may simply be due to alterations in thyroid hormones occurring in non-thyroidal & in this case increased level of leptin has been identified in patients with hypothyroidism

which is perhaps responsible for the development of NAFLD/NASH [14,17].

OBJECTIVES

- To determine whether a relationship exists between Subclinical Hypothyroidism & NAFLD among the obese working women leading unhealthy eating habits.
- To assess the other relationships among BMI, TSH with hypothyroidism & NAFLD Fibrosis Score (N.F.S)
- To find out the impact of the tentative hypothyroidism diet plan.

METHODOLOGY

1. Selection of Subjects

Total 190 obese nondiabetic, non-alcoholic women had a history of SCH & mild to moderate hypothyroidism under the age group 30-40 years located in Kolkata were enrolled for this study for six months with Thyroxin tablet & next six months without this but only diet.

2. Study design & duration

A qualitative study by purposive sampling method was used for the one year study divided into two stages 1st six month & 2nd six month (February 2017- 2018).

3. Geographical Area

15 municipal areas (part of north Kolkata city) were considered for selection of samples.

4. Tools & Techniques used

Data collected through questionnaires based on socio-demographic data, food-frequency, cooking & eating habits. Anthropometric measurements (only BMI), thyroid function tests like TSH, T4 & T3 & other blood tests reports were incorporated as secondary data.[15,16]

5. Statistical-Methods

The statistical analysis performed by SPSS version -16 as a tool. The following tests were used 1) Paired-samples T-test 2) Bivariate Correlations (Pearson correlation). [16,17]

6. Dietary Intervention

Tentative Hypothyroidism Diet Plan (Standard/Average)

Weekly & Rotational plan : 1-2 days veg. menu, rest all days non-veg (Bengali cuisine)

Age – 30-40 years, Female, Height – 150-160 cm & Weight – 60-90, BMI – kg/m²; Diagnosis – NAFLD, Overweight/obese , Hypothyroidism , Foods Habits- non-vegetarian, Lifestyles - Sedentary ,Medication – 25- 50mcg or maximum 100mcg levothyroxine , Pan-D,

Advice – Hypothyroidism diet plan with low carbs, low fat

(Gluten , Goitrogens , Thiocyanates, Flavonoids rich foods.

Under Observation for 30 days. Monitor weight on every 10day.

Daily Calorie Requirement – 1400kcal/day by foods [5]

Some daily exercises to come down weight by safe method & retain for future.

1. Carbohydrate – 1400kcal X 55% = 770 kcal/4 = 192.5gm
2. Protein - 1400kcal X 25% OR Per Kg Body Weight (max.)= 350 kcal/4 = 88gm
- 3 .Fat -15% - 1400kcal X 15% = 210kcal /9 = 23ml< (only cooking oil 2tsf)

No Butter, Ghee all high fats etc. as these all are highly restricted for you.

TENTATIVE DIET PLAN (based on uncooked foods)

6 am – 300ml water with Thyroxine Tablet (As per Physician’s advice)

6.15 am - some drinking water added with 10gm fenugreek seeds (soaked)

30 Min- some exercises /walking / Yoga at open air.

7 am – 2 cream cracker biscuits with black tea (avoid green tea)

8 am – Breakfast – 50 gm Oats meal / Dalia/ 2 Phulkas with low oil ,no spicy mix vegetables should be rich spinach, lettuce + 1 pinch of iodized salt.

9/10 am – Reached at Office/ desk job up to 8 hours or more.

10 am (optional) – drinking water, 1 biscuit, 1 cup green tea

11 am – Fruits (200gm) -1 guava/ berries/pear, apple (except high calorie /high G.I index), 2 almond or cashew or brazil nuts can be helpful.

12-1 pm –Lunch (Office /home) – 50 gm brown rice/ 2-3 Phulka roti + 100gm mix veg (less oil & spices – only homemade), 1pc 50gm fish (preferably seafoods) or 50gm plain paneer , can add green salad & curd/yoghurt 50gm. Sometimes 1 white poultry egg or 100gm chicken leg pc . (Avoid red meat/much animal/organic foods). Add 2 gm or 1 pinch of iodized salt.

3/4 pm (optional) - Tea break/ light snacks at the home/office.

5pm /6 pm –evening – Any light calorie meal – Like 30gm Oat/ Poha/ 2 pcs Idly/ veg. sandwich, puffed rice or rice flakes with salad

8.30 pm (back to home from office)- some water, tea & cream cracker biscuit

9.30 pm – 30gm rice(very less) + 1-2 phulka roti (20gm) , 20gm dal, 1 serving mix veg added with pumpkin seeds, curd 50gm can add. OR almost the same low-calorie diet. (Use some/ negligible iodized salt/sea foods)

10.30 pm – sleep (Pl. note : quantity, quality, recipes, time – are tentative but not too much deviations)

Foods-should-avoid [Gluten, Goitrogens, Thiocyanates, Flavonoids] ____ [18,19]
Cruciferous Vegetables- Broccoli, Brussels sprouts, Cabbage, Cauliflower, Kale Mustard greens Rapeseed, Rutabagas Spinach Turnips, Sweet potatoes
Starchy Plants -Cassava, Corn ,Lima beans ,Linseed, Millet
Fruits - Peaches, Peanuts, Pears, Pine nuts ,Strawberries, Sweet potatoes
Soy-Based Foods - Tofu, Tempeh, Soy milk

KEY RESULTS:

Both the stages of six-month studies (1st & 2nd), Hypothyroid Type & N.F.S relationship was significantly positively correlated. Also, as per statistical analysis & interpretation, 2nd six- month stage showed better results for patients on their health status Both hypothyroidism & NAFLD significantly positively correlated with BMI & TSH range

DISCUSSION

The study showed that 1st six month, 118 Pre-Obese women were consuming Thyroxine tablets 25mcg & 72 Obese –I participants 50 mcg tablet per day for SCH or mild to moderate hypothyroidism due to elevated serum TSH & normal or little low ft₄. During this stage, no diet was being followed except levothyroxine therapy & the study revealed that 100% of patients were suffering from mild & high-risk NAFLD (62% & 38%) but next six months, all were with remain same BMI but normal thyroid level. This 2nd stage was under dietary counseling & all women were under tentative hypothyroid diet plan . NAFLD Fibrosis Score was taken as examination parameter to assess the fatty liver conditions for both the stages.

N.F.S Formula (applied) : -1.675 + 0.037 × age (years) + 0.094 × BMI (kg/m²) + 1.13 × IFG/diabetes (yes = 1, no = 0) + 0.99 × AST/ALT ratio – 0.013 × platelet (×10⁹/l) – 0.66 × albumin (g/dl) .(Results noted based on N.F.S formula)

1st Six-Month Stage : (Average values) - Group -1 : Score was within -1.2 to -1.0 ; Group -2 Score was within 0.850 to 1.1.

2nd Six-Month Stage : (Average values) Group -1 : score - negligible (- 0.575 to - 0.675) ; Group -2 : score within -1.1 to -0.900 .

Results -1st Six-Month : The Paired Samples Correlation adds the information that Hypothyroid Type & N.F.S relationship was significantly positively correlated ($r= 0.188, p < 0.001$). There was a significant average difference between Hypothyroidism & N.F.S [($t_{189} = 62.04, p < 0.001$), 95%, Confidence-Interval, 3.282, 3.497]

No proper diet plan practiced by the patients, only levothyroxine therapy.

Results -2nd Six-Month : The Paired Samples Correlation showed that Hypothyroid Type & N.F.S relationship was significantly positively correlated ($r= 0.305, p < 0.001$). There was a significant average difference between Hypothyroidism & N.F.S [($t_{189} = 66.07, p < 0.001$), 95% Confidence Interval 2.859, 3.035]

P value .000 which is less than .05 (can say $p < .001$ or $P=0.000$ means $P < 0.0005$). Because of this, we can conclude that there is a statistically significant difference between the mean hypothyroidism and N.F.S. Implementation of tentative hypothyroidism diet plan but no levothyroxine therapy. Note: [t = The t-statistic (t-test statistic) for a paired sample t-test; p = The p-value (probability value) for the t-statistic].

SUGGESTIONS

To patients : Patients were suggested to follow only very low fat, bland diet which should be completely free from gluten, gluten ,goitrogens , thiocyanates, flavonoids rich foods helpful for weight loss & may be long-term natural therapy as a diet paradigm for both obese & HT.

For further research : In this topic, scanty research is done , may be due to insufficient data. Needless to say, obesity & hypothyroidism both are very serious health issues also very common in every family. So there is a need of research for the well being of society.

CONCLUSIONS – The study indicates that there is a moderate positive relationship between Subclinical Hypothyroidism & NAFLD among middle-aged obese working women. Further, weight status (BMI-Asian values), TSH level also significantly & positively correlated.

RESULTS - Tables -1st SIX MONTH

Table :1- Paired Samples Statistics & Correlations

	N	Correlation	Sig.
Pair 1 Hypothyroid Type & N.F.S	190	.188	.009

Table -2 Paired Samples Test : Hypothyroid Type & NF.S

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Hypothyroid Type N.F.S	3.389	.753	.055	3.282	3.497	62.042	189	.000

Table :3 Weight Status

Overweight	8	63.3	-55.3
Pre Obesity	115	63.3	51.7
Obesity Class-1	67	63.3	3.7

Table : 4 **Hypothyroid Type**

	Observed N	Expected N	Residual
Subclinical Hypothyroidism	70	63.3	6.7
Mild Hypothyroidism	94	63.3	30.7
Moderate Hypothyroidism	26	63.3	-37.3

RESULTS - Tables -2nd SIX MONTH

Table -5. **Weight Status**

	Observed N	Expected N	Residual
Overweight	12	63.3	-51.3
Pre Obese	110	63.3	46.7
Obesity Class-1	68	63.3	4.7
Total	190		

Table -6 **Hypothyroid Types Status**

	Observed N	Expected N	Residual
Subclinical Hypothyroidism,	136	63.3	72.7
Mild Hypothyroidism	46	63.3	-17.3
Moderate Hypothyroidism	8	63.3	-55.3
Total	190		

Table -7. **NAFLD Fibrosis Score (N.F.S)**

	Observed N	Expected N	Residual
No Risk	118	95.0	23.0
Low Risk	72	95.0	-23.0
Total	190		

Table -8 **Paired Samples Statistics – 2nd -Six Month**

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Hypothyroid Type	4.33	190	.553	.040
N.F.S	1.38	190	.486	.035

Table -9. **Paired Samples Correlations – 2nd Six month**

	N	Correlation	Sig.
Pair 1 Hypothyroid Type & N.F.S	190	.305	.000

Table -10. Paired Samples Test – For 2nd Six month

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Hypothyroid Type & N.F.S	2.947	.615	.045	2.859	3.035	66.065	189	.000

Table -11. Correlations Analysis - 2nd Phase

		Hypothyroid Type	N.F.S
Hypothyroid Type	Pearson Correlation	1	.305**
	Sig. (2-tailed)		.000
N.F.S	Pearson Correlation	.305**	1
	Sig. (2-tailed)	.000	

** . Correlation is significant at the 0.01 level (2-tailed).

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