

Studies on NT-Pro BNP in Relation to Hypothyroidism and Obesity

Atul B. Agte¹, Gangaram L. Bhadarge²

¹Professor, Department of Biochemistry, Parbhani Medical College and R.P. Hospital and Research Center, Parbhani, Maharashtra

²Tutor, Department of Biochemistry, Parbhani Medical College and R.P. Hospital and Research Center, Parbhani, Maharashtra

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Corresponding author: Gangaram L. Bhadarge,

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Abstract

Background: To control and stop the obesity pandemic, we must have a thorough understanding of this developing issue. Thyroid hormones regulate processes in the body that directly impact how the body uses energy, including metabolism and cell growth and development. This connection elevates hormones to a crucial factor in managing weight and, by extension, heart risk. The study's main goals are to understand the relationship between thyroid hormones and obesity and their effects on the heart, as well as the current state of public health and a factor that people have little control over. Numerous studies have been done on cardiovascular disease, thyroid disorders, and obesity, but only a small number have linked body mass index, NT pro BNP, and hypothyroidism in terms of TSH in the Indian population. Many more studies need to be done to fully understand this association and put the results to use in the clinical setting with more hypothyroid patients.

Aim: With the results of the study, we may be able to estimate the cardiac risk in terms of NT pro BNP in non-symptomatic individuals who have just been diagnosed with hypothyroidism and obesity/overweight but no history of thyroid or heart diseases.

Material and Method: The subjects must be older than 20 and younger than 60, without a history of thyroid or heart disease. The scientific personnel who do phlebotomy obtain these details while taking the sample. All tests, including those for lipids, sugar, creatinine, TSH, and NT-pro BNP, were run on the sample while it was fasting. BMI was also computed, and the data were statistically analyzed using SPSS software.

Results: When comparing the lipid parameters of the patients I researched, I discovered that both subjects with and without obesity had the same levels of cholesterol, triglycerides, HDL cholesterol, and LDL cholesterol. Statistics analysis is used to demonstrate this. The difference in HDL between obese and non-obese patients is statistically insignificant. Obese hypothyroid persons have higher levels of NT pro BNP, or more obese people have recently been diagnosed with hypothyroidism. This amply supports the finding that, when compared to Eu thyroids without a history of thyroid or heart issues, N Terminal pro BNP levels are higher in hypothyroidism individuals. More NT pro-BNP is present in obese people than in non-obese ones.

Conclusion: Even though it is statistically insignificant, there is a trend toward the development of cardiac disorders in individuals with recently diagnosed hypothyroidism. This trend was understood by estimation of the incidence of metabolic syndrome, which is more common in obese individuals than non-obese individuals.

Keywords: Master Health Check-up, Body Mass Index, Coronary Heart Disease, - Low Density Lipoprotein, High Density Lipoprotein, National Heart Foundation of Australia, Total Cholesterol.

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Introduction

The relationship between thyroid issues, obesity, and cardiac ailments has been the subject of numerous studies, but the researchers still don't fully understand how these three conditions are related in the Indian population. Therefore, I have attempted to explain through the study "Is there any relevance of including the NT pro-BNP test in the health package as one of the screening tests" and "Are hypothyroid obese people prone to having the risk of heart diseases" The isthmus connects the two cone-shaped lobes of the butterfly-shaped thyroid gland. After passing through the front of the neck, the thyroid gland moves posteriorly until it reaches the esophagus and carotid sheath. [1]

Along with N-terminal Pro B type Natriuretic peptide, BNP is a polypeptide synthesized. There are 32 amino acids in BNP. Its distinctive term is brain. Because it was first discovered in the pig brain, natriuretic peptide is a neurohormone that is mostly synthesized in the cardiac muscle cells as a pre-prohormone by the left ventricular myocardium. A peptide containing 76 amino acids called N-terminal pro-BNP, with a half-life of one to two hours, is used to assess heart risks. Otherwise, NT Pro-BNP concentration rises with aging. The 133 pg/ml approved cutoff is used to diagnose heart failure (for age 75yrs). [2]

Obesity and overweight are mostly caused by an inadequate or absent energy balance. Energy balance is the state in which the amount of energy burned and the amount of energy absorbed are equal. In relation to a person's height and weight, BMI measures total body fat as well as obesity.

kg/m² is used as the measurement unit. When a person's height is specified, the BMI is directly proportional to mass and inversely proportional to the square of height. [3]

The condition known as atherosclerosis, which results in coronary heart disease (CHD) and may cause chest pain and a heart attack, occurs when fatty material or cholesterol accumulates on the inner walls of the coronary arteries, which carry oxygenated blood to the heart. In this instance, the heart restricts blood flow to the necessary extent. Congestive heart failure is a condition in which the heart's pumping ability is slower or less than normal, blood flows more slowly, and the tension or strain on the heart rises as a compensatory strategy. Over time, the effectiveness of the overall process decreases (CHF). In the modern period, both incidence and death rates are rising. Although the exact mechanism by which obesity causes congestive heart disease is unclear, it is known that obesity increases the risk of several illnesses, including diabetes, high blood pressure, and myocardial infarction, all of which increase the risk of congestive heart failure. [4]

The first step in this study's objective is a market survey of those who have coronary heart disease and who have died from it (CHD). There are very few studies, even fewer in the Indian setting, that explore the relationship between high BMI and elevated TSH levels and their relevance to congestive heart disease. Similar to pro-NT BNP, there aren't many research linking obesity, hypothyroidism, and CHD to pro-NT BNP's relationship with these

conditions. [5] Therefore, it is crucial to do cross-sectional studies on Indian cohorts because of how different their lifestyle, diet, and other elements are from those in the west. The association between obese patients presenting with hypothyroidism can be established by measuring the practical and helpful marker NT-pro BNP in diagnosing cardiac damage. Hypothyroid patients who are non-obese and obese may have similar outcomes and risks. The connection between BNP and CHF was described by Lubien E et al. in 2002. They used angiography and ECHO to show the strong correlation between blood levels of BNP and changed left ventricular function, which is evaluated in terms of ejection fraction. [6]

Material and Methods

According to the study's goal, adults who visited the Master Health Check (MHC) department of the hospital, a tertiary care facility, were included. During phlebotomy, the thyroid and cardiac histories of those people are gathered. Blood sugar, lipid profile, BMI, serum creatinine, TSH, metabolic syndrome, age, sex, and NT pro-BNP are a few of the test parameters I have used for my study from the list of tests included in the health check package. Thyroid Stimulating Hormone (TSH) levels are used to identify the population as hypo- or euthyroid individuals.

Inclusion criteria:

1. Subjects between ages 20 to 80 years both male and female.
2. No Thyroid and cardiac history.
3. All recently diagnosed hypothyroid subjects (TSH>4.2micIU/l)

Exclusion criteria:

1. All subjects with age 80 years.
2. With a history of Thyroid and cardiac problems.
3. Subjects whose TSH levels are

Sample Collection:

Estimation of TSH and other metabolites: Fasting venous sample(3 ml) is collected in a gel vacutainer and the serum is been used for TSH and other metabolic parameters like serum Glucose (GOD/POD), Total cholesterol (CHOD/POD), Triglycerides (GPO/POD), HDL cholesterol (enzymatic method) Serum creatinine (enzymatic method).

Methods:

- Estimation of N-Terminal pro-BNP: This test has been done using the immunoassay method on AQT 90FLEX analyzer.
- TSH is estimated on a fully automated platform Minividas from Biomerieux using the ELFA method.

Master lot entry (MLE) data must be utilized to enter the specifications into the instrument when a new batch of reagents is used. Using the calibrator included in the kit, calibration must be completed following the MLE data entry and should be done every 14 days. Utilizing the control included in the kit, calibration must be verified. TSH values must be interpreted in the context of a whole clinical picture.

All of the subjects who met the qualifying requirements underwent BMI and NT pro-BNP testing. Those with normal TSH are the hypothyroidism control group, and non-obese individuals make up the group for obesity. 88 hypothyroid patients will have their BMI evaluated in accordance with the goal. The subjects' height and weight are recorded, and standard techniques for calculating BMI will be applied. Kg/m² is used to calculate BMI.

Statistical analyses: Statistical techniques used to describe, explain, and arrange the gathered data The current study made several inferences using descriptive statistics. The gathered information from that population is summarized using numerical and graphical techniques. The Mean and Standard Deviation of these metrics are used to describe them.

Inferential statistics are used to draw conclusions from the study or to test its hypotheses. Levels of significance are used to gauge the research's significance.

Result

Table 1: Comparison of lipid parameters and blood sugar levels of subjects studied.

Lipid parameters	Controls	Cases
Cholesterol(mg/dl)	167.14±29.41	164.30±30.40
Triglycerides(mg/dl)	127.05±54.30	140.61±40.35
HDL (mg/dl)	37.53±12.21	20.01±7.45
LDL (mg/dl)	102.13±22.59	103.62±30.49
Blood Sugar mg/dl	118.04±53.77	120.57±29.15

When comparing the lipid parameters of the patients I researched, I discovered that both subjects with and without obesity had the same levels of cholesterol, triglycerides, HDL cholesterol, and LDL cholesterol. Statistics analysis is used to demonstrate this. Obese people had lower HDL levels than non-obese ones, but these differences are statistically insignificant. Comparing the control group and cases for

blood sugar revealed statistically identical results for both groups, but more hypothyroid patients had blood sugar levels than Eu thyroids because of the hypothyroid population. Therefore, even if their mean sugar levels are statistically insignificant, patients with hypothyroidism are more likely to develop metabolic syndrome.

Table 2: Study of hypothyroid obese and non-obese subjects for the levels of NT pro-BNP

NT-pro BNP ng/l	Non-obese		Obese	
	No	%	No	%
<133	22	40.2	12	55.7
133-450	7	13.1	5	20.6
>450	1	2.3	2	8.1
Mean ± SD	44.21±22.89		85.70±20.12	

We can infer that NT pro-BNP levels are higher in hypothyroid obese persons or that more obese people have recently been diagnosed hypothyroidism NT pro-BNP values above 133ng/l. This unequivocally supports the finding that hypothyroidism individuals had higher N-terminal pro-BNP levels than Eu thyroids with no history of thyroid or heart diseases.

Table 3: The comparison of NT pro-BNP in ng / L in patients studied

NT Pro-BNP (ng/L)	Non-obese	Obese
Male	53.80±51.72	82.55±29.18
Female	58.29±18.41	144.22±107.01

Obese people have higher levels of NT pro-BNP than non-obese ones. When the gender distribution of obese and non-obese people is compared, females make up a disproportionately larger portion of the non-obese group.

Discussion

Hypothyroidism was explained by Roos A et al. and statistical evidence was provided to support their claim. The population chosen and the criteria used to determine hypothyroidism in this study are different from those in my study. However, in the study by Roos A et al., the T3, T4, and

TSH are regarded as hypothyroid determining parameters. I have used TSH as a hypothyroid screening parameter. Because screening for hypothyroidism was one of the trials' goals, both were comparable. [7]

A few researchers, including Ghanshyam PS Shantha et al., examined and explained that women are particularly vulnerable to metabolic syndrome and hypothyroidism. Therefore, it is necessary to test for hypothyroidism in the female metabolic syndrome test patients. This study is related to the current study in that both studies discussed the role that metabolic syndrome and hypothyroidism play in the development of cardiovascular disease. However, it was unclear in this study whether the association between hypothyroidism, high-sensitivity C-reactive protein, and Met S will result in cardiovascular risk. [8]

Clinically speaking, obesity and mild thyroid dysfunction are both prevalent disorders. It is questionable whether a subclinical hypothyroidism diagnosis for an obese patient should be made based solely on a high serum TSH level. Previous research from this group indicates that detecting subclinical hypothyroidism in people with morbid obesity may require more than an increased serum TSH level. In order to further support the diagnosis of autoimmune thyroid failure, it would therefore seem acceptable to suggest that circulating thyroid antibodies be evaluated in these individuals at all times. [9] This research is comparable to the current research. One of the goals of my study was to compare TSH and obesity before correlating with NT pro-BNP levels. TSH is used as a screening test for hypothyroidism.

Primary hypothyroidism is more common in extremely obese patients than in moderately obese patients, according to a similar study that included pre-existing and newly detected hypothyroid cases and

secondary hypothyroidism while excluding pregnant women and subjects with thyroid cancer. In this study, however, cardiac functions of these patients were not examined, and the study was restricted to female patients from an endocrinology clinic. In 2008, Verma A., et al. [10]

Ozmen B. 2007 reported that patients with hyperthyroidism demonstrated a notable positive association of Free T4 with N Terminal pro-BNP and came to the conclusion that thyroid hormones are related to N Terminal pro-BNP. He employed statistical multiple regression. This study is comparable to the current study in that I used the study group of hypothyroid patients with obesity as a risk factor rather than hyperthyroid patients. [11]

In their 2003 study, Owen et al. explained the positive link between higher body weight and serum cholesterol. However, my recent research has shown that total cholesterol levels in the blood are identical in obese and nonobese people with newly diagnosed hypothyroid cases. Increasing body weight is associated with a drop in the blood's concentration of high-density lipoprotein, according to statistics provided by the World Health Organization in 2000. [12]

In a study by E Passeri published in 2016 [13], it was discovered that there is a positive link between N-terminal pro-BNP, thyroid stimulating hormone, and CHD in the case of children. Therefore, estimating thyroid stimulating hormone for the purpose of detecting thyroid abnormalities early on is crucial for controlling CHD. Prior to the operation, he calculated FT4, NT pro-BNP, and thyroid stimulating hormone on Elecsys 2010 [14]. In young people with coronary heart disease, other factors such as FT3, anti-thyroglobulin autoantibodies, and anti-thyroperoxidase autoantibodies were identified and assessed as the cause of thyroid issues. The only difference between this study and mine is that there isn't a comparison of

BMI, whereas in the present study, the variables utilized as comparison criteria are TSH, NT pro-BNP, and BMI, and the study subjects are adults. We did not measure FT3, FT4, or anti-TPO autoantibodies.

Sena SF, et al. 1988 [15] investigated the population of overt and subclinical thyroid disease (both hypo and hyperthyroidism patients), and they were screened for thyroid state before and after therapy for their thyroid diseases. This research was strikingly similar to my own. Like the current study, he included healthy heart disease-free patients. [16]

Conclusion:

We came to the conclusion that obese patients with recently diagnosed hypothyroidism have higher levels of NT pro-BNP ng/l. i.e., there is a trend, and as a result, I draw the conclusion that individuals with hypothyroidism or TSH levels above the reference range should have their levels of N-terminal pro-BNP checked, as this is a marker for cardiac disease when obesity is considered a risk factor and lipids cannot be relied upon. There is a significant incidence of metabolic syndrome in hypothyroid obese persons, and there is a tendency for those people to develop cardiac diseases. The Master Health Check-up package must include the heart disease marker NT pro-BNP since it is crucial for persons with recently diagnosed hypothyroidism who are obese.

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