Assessment of Nutritional status in Hyperthyroidism patients

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Abstract: Introduction: Hyperthyroidism often referred to as overactive thyroid, is a type of thyrotoxicosis, a hypermetabolic clinical syndrome which occurs when there are elevated serum levels of T3 and/or T4. There are very less studies on the nutritional deficiencies related to hyperthyroidism. Methods: Quantitative determination of Thyrotropin (TSH), triiodothyroinine (T3) and tetraiodothyronine (T4) was analyzed along with nutritional analysis of dietary nutrients like carbohydrate, proteins, fat, vitaminA, B1, B2, C, niacin, etc. Biostatistical analysis and correlations were analyzed by using Graph Pad prism software. Results: The mean intake of nutrients in Hyperthyroid and control groups are: Carbohydrate (147.9 ± 41.89 g, 218.3 ± 100.0 g), Thiamin (0.567 ± 2.850 mg, 1.051 ± 0.470 mg), Riboflavin (0.590 ± 0.341 mg, 1.121 ± 0.415 mg), Niacin (7.560 ± 2.346 mg , 11.59 ± 3.571 mg), pyridoxine (0.066 ± 0.262 mg , 0.317 ± 0.627 mg), Vitamin B1 (0.087 ± 0.205 µg, 0.199 ± 0.306 µg), Folacin (130.0 ± 36.57 µg , 143.4 ± 57.29 µg) and the mean values of all these nutrients were not optimum as recommended by ICMR. Conclusion: We should all be aware of the nutritional deficiencies encountered in hyperthyroidism and hence we can provide considerable support by eliminating adverse influences and normalizing the nutritional status by including multivitamins , antioxidants, etc. along with daily antithyroid drugs. [Skaria L et al NJIRM 2013; 4(5) : 34-38]

Key Words: Hyperthyroidism, Thyroid Stimulating Hormone (TSH), triiodothyroinine (T3) , tetraiodothyronine (T4), nutritional status, multivitamins.

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Introduction: Hyperthyroidism, often referred to as an overactive thyroid, is a condition in which the thyroid gland produces and secretes excessive amounts of the free (not protein bound, and circulating in the blood[1]) thyroid hormones, triiodothyronine (T3) and/or thyroxine (T4). Hyperthyroidism is a type of thyrotoxicosis, hyper metabolic clinical syndrome which occurs when there are elevated serum levels of T3 and/or T4[2]. Hyperthyroidism may be asymptomatic, but when it is not, symptoms are due to an excess of thyroid hormone. Therefore, some of the symptoms of hyperthyroidism are nervousness, irritability, increased perspiration, heart racing, hand tremors, anxiety, difficulty sleeping, thinning of the skin, fine brittle hair, and muscular weakness, weight loss, menstrual disturbances in women, etc.

Worldwide, approximately 1.1% population suffers from Hyperthyroidism[3]. An estimated 108 million people suffer from endocrine and Metabolic disorders in India and out of these 42 million suffer from thyroid disorders [4]. In Bastar region of Chattisgharh in India a study conducted on 150 subjects for thyroid disorders based on signs and symptoms confirmed that 59.3% were hypothyroid, 20.6% were euthyroid, 12.6% had subclinical hypothyroidism, 7.3% were hyperthyroid [5]. Very less work on studies related to the assessment of nutritional status in Hyperthyroidism has been carried out and hence the study was conducted to evaluate the nutritional status in patients of hyperthyroidism.

Materials and Methods: The subjects who visited the medicine department of M. G. M. medical college, Indore were carefully examined . 250 subjects were included in the study group of which 100 patients were of Hyperthyroid along with 150 controls. The quantitative determination of thyrotrophin (TSH), total triiodothyroinine (T3) and total tetraiodothyronine (T4) in human serum was estimated by a microplate immunoenzymetric assay using the reagent kit by Monobind, Lake forest, USA[6,7,8,9,10]. Each patient was in detail nutrionally analyzed by taking down the questionnaire along with 24 hour dietary recall proforma prepared and were nutritionally analyzed along with other nutrients like proteins, carbohydrates, fat, carotene, vitamin A , B1, folacin, thiamin, riboflavin, pyridoxine, calcium, phosphorous, sodium, magnesium, potassium, zinc[11].

Statistical analysis: Biostatistical analysis as well as correlations among parameters in individual groups were established by using Graph Pad Prism Software.

Results: There were two groups in the study group. The first group consisted of Hyperthyroid of 100 patients and second group consisted of control of 150 subjects.

Table 1 shows the distribution of Hyperthyroid patients in different levels of age. Hyperthyroidism was found to be increased among patients 20-to-49 years of age and declined with more than 50 years of age.

Table 1: Distribution table of Hyperthyroid patients in different levels of age groups.

Age groups	Hyperthyroidism (n=100)	Control (n=150)
10-19	07	14
20-29	26	31
30-39	25	54
40-49	28	27
50-59	12	17
60-69	02	07

Table 2 shows the difference of TSH, T3 and T4 levels in Hyperthyroid group compared to the control group. The mean value of TSH in Hyperthyroid group was 0.194 ± 0.047 µIU/mL and in control was 5.082 ± 1.571 µIU/mL and the difference was found to be significant ($p<0.001$). The mean value of T4 in Hyperthyroid group was 14.63 ± 2.631 µg/dL and in control was 8.333 ± 1.827 µg/dL and the difference was found to be significant ($p<0.001$). The mean value of T3 levels in Hyperthyroid group was 2.608 ± 0.891 ng/mL and in control group was 1.063 ± 0.581 ng/mL and the difference was found to be significant ($p<0.001$).

Table 2: Mean and Standard deviation in Hyperthyroid group compared to the controls at T3, T4 and TSH levels.

Hormones	Hyperthyroidism (n=100)	Control (n=150)	p value
TSH	0.194 ± 0.047	5.082 ±	<0.001
T4	14.63 ± 2.631	8.333 ±	<0.001
T3	2.608 ± 0.891	1.063 ±	<0.001

Table 3 shows correlation table of TSH, T3 and T4 levels in Hyperthyroid and control groups. There was a significant positive correlation between T3 and T4 in control group (r = 0.5076). Graph 1 shows the correlation between T3 and T4 levels in the control group.

Table 3: Correlation table of TSH, T4 and T3 levels in Hyperthyroid and control groups.

Correlation between Hormones	Hyperthyroidism (n=100) r value	Control (n=150) r value
T3 & T4		0.5076 **
T3 & TSH	-0.0380*	-0.0078 *
T4 & TSH	0.04007*	0.0629 *

* = Insignificant, ** = Significant positive correlation, ***= Significant negative correlation

Table 4 shows the Mean values of Nutrient Intake by the subjects in Hyperthyroid and control group. The mean energy intake in Hyperthyroid and control groups were (1517 ± 337.8 kcal) and (2198 ± 393.6 kcal) respectively.

Table 4: Mean Nutrient Intake of subjects in Hyperthyroid and control groups.

Nutrient intake	Hyperthyroidism (n=100)	Control (n=150)
Protein	31.16 ± 12.44 g	57.07 ± 22.07 g
Fat	71.09 ± 22.85 g	101.3 ± 50.97 g
Saturated fat	25.29 ± 10.90 g	38.61 ± 9.935g
PUFA	9.330 ± 7.080 g	36.6 ± 16.54 g
Fibre	3.250 ± 9.230 g	4.707 ± 6.013 g
Carbohydrate	147.9 ± 41.89 g	218.3 ± 100.0 g
Energy	1517 ± 337.8 kcal	2198 ± 393.6 kcal
Calcium	313.4 ± 114.5 mg	411.2 ± 142.3 mg
Phosphorous	589.3 ± 227.9 mg	581.3 ± 176.7 mg
Carotene	241.4 ± 137.1 µg	460.3 ± 148.3 µg
Thiamin	0.567 ± 2.850 mg	1.051 ± 0.470 mg
Riboflavin	0.590 ± 0.341mg	1.121 ± 0.415 mg
Niacin	7.560 ± 2.346 mg	11.59 ± 3.571mg
Pyridoxine	0.066 ± 0.262 mg	0.317 ± 0.627 mg
Vitamin B1	0.087 ± 0.205 µg	0.199 ± 0.306 µg
Folacin	130.0 ± 36.57 µg	143.4 ± 57.29 µg
Vitamin C	102.8 ± 173.6 mg	153.6 ± 54.50 mg
Zinc	1.180 ± 2.904 mg	9.240 ± 6.652 mg
Vitamin A	350.8 ± 1033 RE	403.7 ± 476.3 RE
Sodium	94.40 ± 163.2 mg	155.7 ± 238.2 mg
Potassium	148.3 ± 252.1 mg	456.9 ± 208.3 mg
Magnesium	20.74 ± 25.79 mg	28.07 ± 12.67 mg

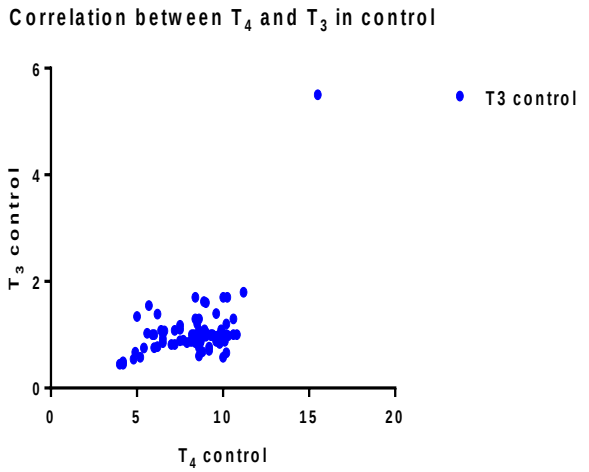
The mean intake of nutrients in Hyperthyroid and control groups are: Carbohydrate (147.9 ± 41.89 g, 218.3 ± 100.0 g), Thiamin (0.567 ± 2.850 mg, 1.051 ± 0.470 mg), Riboflavin (0.590 ± 0.341 mg, 1.121 ± 0.415 mg), Niacin (7.560 ± 2.346 mg , 11.59 ± 3.571 mg), pyridoxine (0.066 ± 0.262 mg , 0.317 ± 0.627 mg), Vitamin B1 (0.087 ± 0.205 µg, 0.199 ± 0.306 µg), Folacin (130.0 ± 36.57 µg , 143.4 ± 57.29 µg) and the mean values of all these nutrients were not optimum as recommended by ICMR.

The mean intake of Zinc in Hyperthyroid group was (1.180 ± 2.904 mg) was very low compared to 10mg/day as recommended by ICMR. The mean values of Vitamin C in Hyperthyroid group was (102.8 ± 173.6 mg) was optimum as suggested by ICMR. While the mean values Sodium in hyperthyroid (94.40 ± 163.2 mg), Potassium (148.3 ± 252.1 mg), Magnesium (20.74 ± 25.79 mg) were not near the optimum as suggested by ICMR.

The History of the Pharmacy and Pharmacology dates back to the medieval times with priests, both men and women, who ministered to the sick with religious rites as well. It gradually spread to Europe as alchemy, eventually evolving into chemistry as physicians began to abandon beliefs that were not demonstrable in the physical world. Physicians often both prepared and prescribed medicines; individual pharmacists not only compounded prescriptions but manufactured medicaments in bulk lots for general sale. Not until well into the 19th century was the distinction between the pharmacist as a compounder of medicines and the physician as a therapist generally accepted. The most notable change in pharmacy in modern times has been the virtual disappearance of the preparation and compounding of medicines. Whereas in the 1920s, 80 percent of the prescriptions filled in American pharmacies required knowledge of compounding, by the 1940s the number of prescriptions requiring compounding had declined to 26 percent. As far back as 1971, only 1 percent, or less, of all prescriptions combined two or more active ingredients.

Pharmacy practical including compounding and dispensing of drugs forms a part of the curriculum of undergraduate medical students in West Bengal. TS Hariharan wrote in his letter to the editor of Indian Journal of Pharmacology in this context, "…Since time immemorial, experimental pharmacology and dispensing pharmacy have constituted the cornerstones of practical exercises in pharmacology. Every time an expert committee is appointed by the Medical Council of India (MCI) with the idea of revising the curriculum, many welcome and innovative changes are suggested for most of the disciplines; yet nothing has been done so far to revise and update the syllabus for practical exercises in Pharmacology and to make them more need-based and meaningful."[1] Yet another editorial of the Indian Journal of Pharmacology said similar words. Since the final examinations are divided into theory and practical, it is imperative that the students are taught one or other experiment. Pharmacy practical exercises have stood the test of time and according to the author these are continued sadly despite several advances in pharmacology and better alternatives that can serve the student better for life.[2]

Graph 1:



We have found that there are many second professional students who do not take pharmacy practical classes seriously. This is reflected in their absenteeism, lack of interest and poor performance in practical exams. The aim of this study was to assess the opinion of the second professional students and their teachers towards pharmacy practical classes.

Discussion: The calorie intake and the carbohydrate intake in hyperthyroid group were low compared with the controls which was similar

to the study[12] where the dietary calorie and the carbohydrate intake in groups of hypothyroid and hypothyroid associated infertility was found to be low when compared with that of controls.

Also the mean value of nutrients like thiamin, Riboflavin, Niacin, Pyridoxine, Vitamin B1 , Folacin were found to be low in hyperthyroid group when compared with the control group which was similar to the study conducted in Hypothyroid patients the mean value of nutrients like thiamin, Riboflavin, Niacin, Pyridoxine, Vitamin B1 , Folacin were not optimum as suggested by the ICMR[12].

Also the zinc level was low in hyperthyroid group as suggested by the ICMR recommendation which again is similar to the study were zinc levels were low in hypothyroid groups[12] . The possible explanation would be because of high phytate content due to consumption of goitrogenic foods seen among the patients of both the groups. Zinc effects on thyroid hormones are complex and include both synthesis and mode of action[13]. Thyroid transcription factors which are essential for modulation of gene expression contain zinc at cysteine residues[14].

Thyroid conditions, especially hyperthyroidism, are characterized by serious nutritional deficiencies. Nutritional deficiencies cause a disruption of both endocrine and immune functions. The endocrine and immune systems are so closely related because their function rely upon the same essential nutrients.

The foods rich in high in B-vitamins and iron, such as whole grains , fresh cruciferous vegetables and sea vegetables, antioxidant foods including fruits such as blue berries, cherries, and tomatoes, must be included in hyperthyroid subjects. Refined foods, such as white breads, pastas, and sugar should be avoided.

Conclusion: The mean value of dietary intake of most of the nutrients in Hyperthyroid subjects were deficient and were not in accordance as suggested by the ICMR. We should all be aware of the nutritional deficiencies encountered in hyperthyroidism and hence we can provide considerable support by eliminating adverse influences and normalizing the nutritional status. Along with antithyroid drugs for the treatment of hyperthyroid subjects a multivitamin daily, containing the antioxidant vitamins A, C, E, the B-complex vitamins, and trace minerals such as magnesium, calcium, zinc, and selenium should be included. Omega-3 fatty acids, such as fish oil, 1 - 2 capsules to help decrease inflammation and help with immunity. Vitamin C, 500 - 1,000 mg daily, as an antioxidant and for immune support. Alpha-lipoic acid, 25 - 50 mg twice daily, for antioxidant support.

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