

Prevalence and Nutritional Assessment of Patients with Thyroid Gland Disorders

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Abstract

A prospective observational study was planned and conducted on 30 patients admitted in Mahatma Gandhi Medical College and Hospital under Department of Medicine for the treatment of hypothyroidism. Sample selection was done using purposive random sampling technique. Patients were observed for co-morbidities like diabetes, kidney problems, cardiac problems, liver diseases and bone health. Results of the present study indicated that 10% patients were underweight, 15% were normal healthy as per Subjective global assessment (SGA), 45% were overweight while 30% were obese. In these patients 30% patients were diabetic, 15% suffered for kidney problems, 10% patients showed neurological symptoms, cardiology problems were observed in 45% cases, 5% showed impaired bone health, 10% patients showed liver problems. In patients SGA ratings 20% patients showed rating A, 45% with rating B, 30% of the patients were presented with rating C. It showed that majority of patients were at risk of malnutrition and have poor intake of healthy foods in their diet who suffered from this metabolic disorder of hypothyroidism.

Keywords

Hypothyroidism, hyperthyroidism, nutritional status, anthropometry, biochemical reports, clinical signs & symptoms

Introduction

Thyroid gland is located just below the Adam's apple in the neck of human body. It's a small butterfly shaped gland weighing less than an ounce. Hormones produced by thyroid gland affect nearly all organs of the body. Two hormones are secreted by thyroid gland - T3 (Tri-iodothyronine) and T4 (Thyroxine) after it's stimulation by TSH (Thyroid stimulating hormone) that is produced by Pituitary gland (Food & the Nutrition Care Process, 15th Edition).

Hyperthyroidism

Overactive Thyroid gland producing excessive thyroid hormones is known as Hyperthyroidism. It may occur in Grave's disease as well which is an autoimmune disorder causing enlarged thyroid gland (goiter). The over-production of thyroid hormone may cause profound metabolic imbalance called Thyrotoxicosis. Symptoms of Hyperthyroidism include heat intolerance or sweating, weight loss, vision changes, altered appetite, fatigue and muscular weakness, menstrual disturbance, mental disturbances, sleep problems and thyroid enlargement.

Hypothyroidism

Hypothyroidism occurs due to underactive thyroid gland in which secretion of thyroid hormone is below standard levels. It occurs mostly by an autoimmune disorder called Hashimoto's Thyroiditis that destroys thyroid gland tissue. Typical symptoms include weight gain, low energy, cold hands and feet, fatigue, hypercholesterolemia, heavy menses, dry coarse hair, muscle pain, depression, forgetfulness and cognitive deficits.

Pathophysiology

The enlarged and inflamed thyroid gland becomes inactive and produces less hormones and makes the gland non-functional. Body's antibodies attack itself in condition of thyroid disorders specially in hypothyroidism. It may be identified as Hashimoto's thyroiditis during antibody test. Antibodies - thyroid peroxidase (TPOAb) are an indicator for this situation, therefore lab investigation for TPOAb is very important. Gawron et. al (2022) also studied about subclinical hypothyroidism with presence or absence of antithyroid antibody with PCOS. There may be persistent symptoms even normal thyroid test like adrenal insufficiency, anaemia, B12 deficiency, iron deficiency, chronic kidney disease, depression, anxiety disorders, somatoform disorders, liver disease, obstructive apnoea, viral infections, vitamin D deficiency etc. Potential risk factors for thyroid disorders were studied by Felker et. al (2016). O'Grady and Cody (2011) performed their research on subclinical hypothyroidism happening during childhood.

Thyroid Function Range and its interpretation -

TSH >2 mIU/L indicates Increased risk of hypothyroidism in near 20 years

TSH >4 mIU/L reveals increased risk of heart disease

TSH 2-4 mIU/L is indicative of cholesterol values respond to thyroxine replacement

Prevalence of Hypothyroidism

The prevalence of hypothyroidism in India is as high as 11% which is quiet high in comparison to UK (2%) and the USA (4.6%). It may be linked to long standing iodine deficiency in the country. Inland cities have a higher prevalence rate (11.7%) in comparison to coastal cities (9.5%). The highest prevalence of hypothyroidism (13.1%) is noted in people aged 46–54 years, with people aged 18–35 years being less affected (7.5%) Hypothyroidism in India: more to be done (thelancet.com). Hypothyroidism: An Update - American Family Physician (aafp.org)

Research Methodology

A prospective observational study was planned and conducted on 30 patients admitted in Mahatma Gandhi Medical College and Hospital under Department of Medicine for the treatment of hypothyroidism. Sample selection was done using purposive random sampling technique. Following criteria were taken for patient selection.

Inclusion criteria

1. Patient should be in the age group of 18 – 80 years of age
2. Both male & female were included
3. Patient should be willing to participate in the study
4. He/she should not have any other serious medical complication

Exclusion criteria

1. Patient < 18 years and > 80 years of age
2. Patient unwilling to participate or cooperate
3. He/she having any other serious medical complication

Data collection

Part 1: General Information

Patient's general information was noted as per following format -

- Name
- Age
- Place
- Education
- Working status of the respondent
- Type of Activity
- Economic Status
- Marital Status

Part 2: Anthropometry Measurements

- Weight was taken using digital weighing balance by following standard guidelines of taking weight with minimum clothing and without shoes
- Height was taken using heightometer. Patients were asked to stand without shoes/ foot wears and without any puffy hair style. It was done on a flat surface

- Waist circumference was done at fasting state using a non stretchable flexible measuring tape positioned at just above the iliac crest, at the end of normal expiration with the subject standing erect and looking forward
- Hip circumference was also taken using non stretchable flexible measuring tape
- Mid upper arm circumference was measured using non stretchable flexible measuring tape from olecranon process and acromium. Mid point was marked between 2 points and then arm hanging straight down and then the arm circumference at that midpoint mark was taken.
- BMI was calculated using following formula –
 $\text{Weight (Kg)} / \text{Height (M}^2\text{)}$
- Waist / hip circumference ratio (WHR):- After measuring waist and hip circumference, its ratio was calculated to find out type of fat distribution in body.

Part 3: Biochemical data

Patient's relevant biochemical reports were noted to find out any significant changes.

Parameter	Result values	References
T3		
T4		
TSH		
BP		
S. Creatinine		
HbA1C		

Table 1: Sample table for recording of biochemical parameters

Part 4: Clinical Sign & Symptoms

Patients were observed for following clinical signs and symptoms.

Signs & Symptoms	Yes / No
Arthralgias	
Cold intolerance*	
Constipation	
Depression	
Difficulty concentrating	
Dry skin	
Fatigue*	
Hair thinning / hair loss	
Memory impairment	

Menorrhagia	
Myalgias	
Weakness	
Weight gain	
Bradycardia	
Coarse faeces	
Cognitive impairment	
Delayed relaxation phase of deep tendon reflexes	
Diastolic hypertension	
Oedema	
Goitre	
Hypothermia	

Table 2. Sample table for clinical signs & symptoms

Part 5: Dietary History

24 Hours Home Recall: 24 hours dietary recall is a tool to find out nutrient intake of the person. Comparing this intake with the requirements, one can evaluate the adequacy of diet as well as the nutritional status of the person.

Time	Meal	Menu	Household measures	Calorie	Protein	Cho	Fat	Fibre
6:30 am	Early Morning							
2:00 pm	Lunch							
3:30 pm	Evening							
5:30 pm	Snack							
10 pm	Dinner							

Table 3: Sample table to record 24 hour diet intake

Empty calories intake through food frequency

Food item	Daily	Weekly	Fortnight	Monthly	Total calories intake /day
Oil					
Sugar					
Cold drinks/ sharbat/juice					
Pickles /fried food/ junk food					
Alcohol					
Total					

Table 4: Sample table for food frequency questionnaire

Part 6: Nutritional diagnosis was derived as per SGA rating. On the basis of nutritional status, patient's requirements were calculated and as per the requirements, diet chart was given as following format -

Sample menu
• Walk for 30 – 40 mins. • 7 am - 1 cup sugar free tea + 3 Sugarfree biscuit + 1 bowl of sprouts/ roasted chana • 8 am - 9am – ½ glass milk (sugarfree) + 1 bowl poha / 1 bowl upma / 1 bowl cornflakes / 1 suji cheela / 1 bowl rabdi / 1 bowl daliya • 11 am - fruit 100 g • 1 pm – 1 plate salad+ 2 chapati / 1 plate rice+ 1 bowl dal + 1 bowl veg. + 1 bowl curd / 1 glass buttermilk • 5 pm – 1 cup tea sugar free + 2 eggs omellate / 100 g paneer. • 8pm - 1 plate salad+ 2 chapati / 1 plate rice+ ½ bowl dal + 1 bowl veg. • Walk for 30 – 40 mins.

Table 5: Sample diet chart

Results & Discussion

Data collected has been presented under following subheadings:

1. Demographic profile of patients

Parameters	No. of patients (N = 30)	Percentage
Age		
19 – 30 years	7	23.33 %
31 – 50 years	5	16.66 %
51 – 70 years	12	40 %
>70 years	6	20 %
Sex		
Male	12	40 %
Female	18	60 %
Place		
Jaipur	14	46.66 %
Sawaimadhopur	9	30 %
Bharatpur	3	10 %
Nagaur	2	6.66 %
Ajmer	2	6.66 %
Marital status		
Married	28	93.33 %
Unmarried	2	6.66 %
Economic status		
LIG	4	13.33 %
MIG	26	86.66 %
HIG	0	
Activity pattern		
Sedentary	30	100 %
Moderate	0	0
Heavy	0	0

Table 6. Demography of patients

The above table 6 is showing the demographic profile of patients. It has been seen that patient's age ranged from 19 – 86 years of age. In these 18 were females, while 12 were males. These were distributed all over Rajasthan i.e., patients came from Jaipur, Sawaimadhopur, Karauli, Nagaur, Tonk, Ganganagar, Alwar, Bikaner and Bharatpur districts. Ninety three percent patients were married. Economic status showed 86.66% patients were from middle income group, only 13.33% were from lower income group. Hundred percent patients were found from sedentary activity group.

Co-morbidity	Diabetes	Kidney disease	Neurological problem	Cardiac problem	Bone problems	Liver problems	Pregnancy
Percentage	30%	15%	10%	45%	5%	10%	10%

Table 7. Prevalence of co-morbidity with thyroid gland disorders

Table 7 is revealing that majority of cases had either diabetes (30 %) or cardiac problems (45%). These are in very much consonance with the findings of Rodondi et. al (2010).

2. Nutritional status of patients

2.1 Anthropometry

Parameters		Total number of males (N=12)	Total number of females (N=18)
Mean Height		170	156
Mean weight		67	72
BMI	Normal (18.5- 22.9 kg/M2)	8	5
	Underweight (16 - 17.9 kg/M2)	2	0
Overweight (23 - 24.9 kg/M2)		1	10
Obese (> 25kg/M2)		1	3
MUAC	Normal	10	7
	Below normal	0	0
	Above normal	2	11
WC		90	90
HC		98	90
WHR		0.92	1

Table 8. Anthropometric measurement of the participants

Above table 8 is showing that mean height, weight and BMI of male patients was 170 cm, 67 kg and 23.18 kg/M2 respectively. Female patients showed mean height 156 cm, mean weight 72 Kg and mean BMI of 29.63 kg/M2. It made it clear that majority of male patients were near normal or overweight and majority of them suffered from hyperthyroidism while significantly higher number of female patients were in the category of obese as most of them suffered from hypothyroidism that led to weight gain. Similar pattern was noticed for waist circumference, hip circumference and waist to hip ratio also.

2.2 Biochemical Reports

Parameters	Variables	Total number of patients (N=30)	Percentage
Haemoglobin	Normal	18	60.00%

(11.5 to16.5g/dl)	Low	12	40.00%
	High	0	0.00%
Blood pressure (120/80mm of Hg)	Normal	8	26.66 %
	Low	8	26. 66 %
	High	14	46.66%
Blood sugar (60 to 140mg/dl)	Normal	15	50%
	Low	3	3.30%
	High	10	33.33 %
Platelet (1.5 - 4.5 lakhs)	Normal	28	93.30%
	Low	0	0.00%
	High	2	6.66%
TSH (0.5to5MIU/L)	Normal	15	50%
	Low	1	3.33%
	High	14	46.66 %
T3	Normal	16	53.33 %
	Low	4	13.33 %
	High	10	33.33 %
T4	Normal	15	50 %
	Low	14	46.66%
	High	1	3.33 %

Table 9. Biochemical Reports of selected thyroid disorder patients

Above table 9 is revealing the fact that 46.66 % patients showed high TSH & low T4 levels that is a clear indication of hypothyroidism while only 3.33 percent patients exhibited TSH and T4 levels in the category of hyperthyroidism. 15 percent patients showed normal TSH and T4 levels. Similar pattern was noticed for T3 levels as well. Besides this 40% patients presented with low haemoglobin levels, high blood pressure was noted in 46.66% patients. Fifty percent patients showed normal blood sugar levels while 33.33% exhibited higher levels for blood glucose. Shimizu et. al (2022) also studied effect of subclinical hypothyroidism on HbA1c and reduced renal function.

2.3 Clinical signs & symptoms

Signs & Symptoms	No. of patients (N = 30)	Percentage
Arthralgias	10	33.33%
Cold intolerance*	24	80%
Constipation	15	50%
Depression	5	16.66%
Difficulty concentrating	6	6.66%
Dry skin	10	33.33%
Fatigue*	20	66.66%
Hair thinning/hair loss	15	50 %
Memory impairment	2	6.66%
Menorrhagia	3	9.99%
Myalgias	8	26.66 %
Weakness	22	73.33%
Weight gain	24	80%
Bradycardia	2	6.66%
Coarse faeces	2	6.66%
Cognitive impairment	3	9.99 %
Delayed relaxation phase of deep tendon reflexes	10	33.33%
Diastolic hypertension	12	40%
Oedema	10	33.33%
Goitre	2	3.33%

Table 10. Clinical signs & symptoms of selected thyroid disorder patients

Above table 10 is revealing that 80% of patients showed symptoms of hypothyroidism like weight gain and cold intolerance. 73.33% patients complaint for feeling of weakness. 20 out of 30 patients exhibited fatigue. Fifty percent patients faced problem of hair thinning and hair loss. Thirty three percent patients showed symptoms of arthralgia, oedema and dry skin. Other signs and symptoms were also noted related to thyroid gland disorders although statistically not significant ($p>0.05$).

2.4 24 hours home recall

Nutrient intake as per RDAs		Total number of patients (N=30)	Percentage
Energy	100.00%	0	0%
	80 - 99%	11	36.6%
	70 - 89%	7	23.3%
	60 -79%	8	26.6%
	<60%	4	13.33%
Protein	100.00%	0	0%
	80-99%	17	56.6%
	69-79%	10	33.3
	<60%	3	10 %
Fat	100.00%	15	50%
	80-99%	10	33.33%
	69-79%	5	16.66%
	<60%	0	0
Carbohydrates	100.00%	20	66.66%
	80-99%	10	33.33%
	69-79%	0	0
Iron	100.00%	2	6.66%
	80-99%	5	16.66%
	69-79%	10	33.33%
	<60%	10	33.33%
Vitamin C	100.00%	0	0
	80-99%	5	16.66%
	69-79%	10	33.33%
	<60%	15	50%
Sodium	100.00%	28	93.33%
	80-99%	2	6.66%
	69-79%	0	0
	<60%	0	0
Fibre	100.00%	7	23.33 %
	80-99%	8	26.66%
	69-79%	15	50%
	<60%	0	0

Table 11 . 24 hr. recall of selected patients

It is depicted by table 11 that energy consumption of majority of patients fell in the category of 60 - 90%. Similar trend was observed for protein consumption as well. Carbohydrate and fat consumption was seen somewhat at a higher side, that may be linked to weight gain in patients. Consumption of iron was noted below 80% or below 60% in most of the cases. Fifty percent patients revealed less than 60% intake of vitamin C while consumption of sodium content was found on a significantly ($p < 0.05$) higher side. Fibre consumption was also seen towards a lower side.

2.5 Nutritional Diagnosis of patients

SGA rating	A	B	C
	20%	45%	30%

It was clear from the data collected that 30% of patients with thyroid gland disorder were severely malnourished while 45 % cases were mild to moderately malnourished. Only 20% patients depicted normal nutritional status.

Conclusion

Results of the present study indicated that 30% patients were in the category of SGA rating C i.e. malnourished. It showed that 30% patients were obese or in the category of severely malnourished on the basis of anthropometry, biochemical reports, clinical signs and symptoms and dietary recall. Forty five percent patients were at risk of malnutrition as they received SGA rating B when nutritional assessment was done on hospitalization. Only 20% patients showed normal nutritional status. Of all patients, majority of patients suffered with co-morbidities also as, 30% patients were diabetic, 15% suffered for kidney problems, 10% patients showed neurological symptoms, cardiology problems were observed in 45% cases, 5% showed impaired bone health, 10% patients showed liver problems.

References

1. Felker, P., Bunch, R. & Leung, A. M. (2016). Concentrations of thiocyanate and goitrin in human plasma, their precursor concentrations in brassica vegetables, and associated potential risk for hypothyroidism. *Nutrition reviews*, 74(4), 248-258
2. Food & the Nutrition Care Process, 15th Edition by Krause and Mahan, Elsevier Publication
3. Gawron, I. M., Baran, R., Derbis, K. & Jach, R. (2022). Association of Subclinical Hypothyroidism with Present and Absent Anti-Thyroid Antibodies with PCOS Phenotypes and Metabolic Profile. *Journal of Clinical Medicine*, 11(6), 1547
4. Hypothyroidism in India: more to be done (thelancet.com)
5. Hypothyroidism: An Update - American Family Physician (aafp.org)
6. O'Grady, M. J. & Cody, D. (2011). Subclinical hypothyroidism in childhood. *Archives of Disease in Childhood*, 96(3), 280-284
7. Rodondi, N., Den Elzen, W. P., Bauer, D. C., Cappola, A. R., Razvi, S., Walsh, J. P., ... & Thyroid Studies Collaboration, F. T. (2010). Subclinical hypothyroidism and the risk of coronary heart disease and mortality. *Jama*, 304(12), 1365-1374

8. Shimizu, Y., Kawashiri, S. Y., Noguchi, Y., Nakamichi, S., Nagata, Y., Maeda, T. & Hayashida, N. (2022). Effect of Subclinical Hypothyroidism on the Association between Haemoglobin A1c and Reduced Renal Function: A Prospective Study. *Diagnostics*, 12(2), 462