Research article

A study of thyroid dysfunction among elderly in a tertiary care hospitalSadhna Sharma¹, Biju Govind², Satyamaharshi T.S.A.³, M. Divya Vani³, M. Shivshankar³¹Professor and Head, ³Junior Resident, Internal Medicine, ²Professor, Cardiology, NRI Medical College, Chinakakani, Namburu, Guntur District, 522 508, Andhra Pradesh, India

(Received: November 2020

Revised: May 2021

Accepted: June 2021)

Corresponding author: **Biju Govind**. Email: shivmindi@gmail.com**ABSTRACT**

Introduction and Aim: The prevalence of thyroid disorders all over the world is on the rise. However, the diagnosis is complicated among the elderly due to factors such as non-specific clinical manifestations and interacting medications. The aim of the study is to estimate the prevalence and type of thyroid dysfunction among the elderly.

Materials and Methods: The cross-sectional study was undertaken in the Department of General Medicine of a tertiary care teaching hospital. The study included 100 subjects aged above 60 years, of both genders. Data for clinical examination and biochemical tests such as T₃, T₄, TSH and lipid profile were collected. Reports of USG/FNAC, performed in cases of thyroid nodule, were also checked.

Results: The prevalence of thyroid disorders was 22% of the study population. Overt and subclinical hypothyroidism were observed among 4% and 17% respectively, with 1% having hyperthyroidism. Subclinical hypothyroidism was more common among women. No specific trend was observed with increasing age. TPO antibodies were positive among 73% of the cases. Patients with thyroid dysfunction had higher values of triglycerides, total cholesterol and LDL. The proportion of dyslipidemia was significantly higher among elderly with thyroid dysfunction as compared to people with no thyroid dysfunction (90.90% Vs 24.35%, P value < 0.001).

Conclusion: Thyroid dysfunction in the elderly is common. Strong clinical suspicion of thyroid diseases in elderly patients presenting with non-specific symptoms is needed. This would aid in the diagnosis of thyroid disorders among the elderly.

Keywords: Sub clinical hypothyroidism; thyroid function test; geriatric population; dyslipidemia.

INTRODUCTION

The world is undergoing a demographic transition as the proportion of the elderly has reached 8.5% globally and 8.6% in India(1). Thyroid disorders are amongst the most common endocrine abnormalities.

Many previous studies conducted on general population, pregnant women, patients with type 2 diabetes or hypertension etc. have documented higher proportion of subclinical thyroid dysfunction (hypo or hyper thyroidism) than overt thyroid dysfunction (2). Similar findings were reported among the elderly subjects also (3). Among the elderly population nonspecific symptoms like lack of appetite, constipation, mood variations, fatigability etc. are attributed to aging process and other co-morbid conditions(4). Hence there is a higher probability of missing the diagnosis of underlying subclinical thyroid dysfunction among them, as compared to younger age groups. Studies also have documented that significant proportion of subclinical hypothyroid patients in older age groups progress to overt hypothyroidism (5).

Hence documenting the true burden of subclinical thyroid dysfunction may aid in drawing the attention of the relevant stakeholders this underdiagnosed

entity. But there are very few studies documenting the burden and among elderly subjects in India.

MATERIALS AND METHODS

The cross-sectional observational study was conducted among elderly subjects (aged above 60 years as per the national policy on older persons, Government of India), between September 2018 to March 2019. The approval for all human procedures in this study was obtained from ethical review board of NRI medical college and Hospital (Ref number: NRIAS/IEC/412/2018). All participants agreed to and signed the informed consent prior to the study. The study has been conducted in compliance with the ethical standards required by the 1964 Declaration of Helsinki and its subsequent amendments.

Patients attending the OPD at Department of General Medicine of a tertiary care teaching hospital aged 60 years and above and who complained of generalised weakness, easy fatigability, lethargy were selected for the study. These patients were clinically suspected to have thyroid dysfunction (symptoms of hypo/hyperthyroidism). Patients with vague symptoms such as generalised weakness, easy fatigability, lethargy and disinterest in daily activities were included in the study. All patients that were acutely sick, those with established thyroid disorders, those on thyroid supplements and drugs known to alter

thyroid function, those who have undergone thyroid surgery or taken radioactive iodine therapy, those on iodine-containing vitamins or minerals and those evaluated with radiological tests using contrast media in the recent past were excluded from the study.

The required sample size was calculated to be 93 assuming the expected prevalence of thyroid dysfunction as 19.2% as per the study by Kumar H et al (6). 7% absolute precision and 95% confidence level. To account of for non-participation rate of about 5%, the minimum required sample size was 98. A total of 100 subjects were included in the final analysis.

A detailed clinical examination and biochemical tests were performed. For the examination, a pretested proforma with demography, anthropometry and clinical details was used.

Laboratory evaluation of thyroid function was done by estimation of serum T3, T4 and TSH levels by chemiluminescence assay method using the COBAS 6000 machine. The normal values in the elderly for T3 was taken as 0.846-2.02 ng/ml, for T4 as 5.13-14.06 ng/dl and TSH as 0.27-5.0 mc IU/ml. When values of T3, T4 were low and TSH was high, it was considered as hypothyroidism. If T3, T4 were normal and only TSH was elevated, it was considered as subclinical hypothyroidism. If values of T3, T4 were increased and TSH was reduced, it was considered as hyperthyroidism. If T3, T4 were normal and only TSH was reduced, it was considered as subclinical hyperthyroidism. Those found to have altered thyroid function were subjected to the thyroid antibody (TPO)

test which was estimated using the chemiluminescence method. The normal range of TPO in elderly was 0-34 IU/ml.

When nodule was present, further relevant investigations such as USG/FNAC neck were performed. The USG of the thyroid was performed using a GE Voluson 730 Pro machine with a probe frequency of 6-12 MHz. 10 ml of venous blood was collected under aseptic Laboratory parameters like complete Blood Count, Random blood sugar, fasting lipid profile were also performed. ESR, ECG and 2D ECHO were done when indicated.

Statistical analysis

Data was entered using MS Excel and analyzed using SPSS version 22.0. Numerical data were expressed using means with standard deviations, and categorical data were summarized using percentages. Independent samples t-test was used to compare the differences between means. A p value of less than 0.05 was considered statistically significant.

RESULTS

A total of 100 patients with mean age of 60±80 were included in the final analysis. The overall prevalence of hypothyroidism was 21%, and 1% had hyperthyroidism. Out of the hypothyroid, 17% were subclinical and only 4% were clinically manifest. Out of the 58 females and 42 males studied, the prevalence of thyroid dysfunction was more among females (25.86%) than in males (16.67%) with a female: male ratio of 1.55:1, showing a female preponderance (Table/fig. 1).

Table 1: Distribution of Thyroid dysfunction in a total population study (n=100)

Thyroid dysfunction	Males (n=42)	Females (n=58)	Total (n=100)
1. Hypothyroidism	7 (16.67%)	14 (24.14%)	21 (21%)
a) Clinical	2 (4.76%)	2 (3.45%)	4 (4%)
b) Subclinical	5 (11.9%)	12 (20.68%)	17 (17%)
2. Hyperthyroidism	0	1	1 (1%)
a) Clinical	-	1 (1.72%)	1
b) Subclinical	-	-	0

Fig. 1: Age distribution of Thyroid dysfunction in the study total population study Age distribution of thyroid disorders (n=22)

The prevalence of thyroid disorders did not show any specific trend with the increasing age of the person. It was high at 24% in 60 to 65 years age group, then reduced to 12.5% in the next decade. In the 76 to 80

and > 80-year age groups, a higher prevalence was documented at 25% and 20% respectively (Table/fig. 2).

Table 2: Clinical features of Hypothyroidism (n=21)

Clinical symptom/sign	Clinical (n=4)	Subclinical (n=17)
Easy fatigability, N (%)	4 (100)	17 (100)
Generalised weakness, N (%)	4 (100)	17 (100)
Anorexia, N (%)	3 (75)	12 (70)
Swelling of limbs / face, N (%)	1 (25)	6 (35)
Weight gain, N (%)	3 (75)	10 (58)
Constipation, N (%)	3 (75)	11 (65)
Sluggish ankle jerk, N (%)	3 (75)	4 (23)
Goitre, N (%)	2 (50)	–
Dry /coarse skin, N (%)	3 (75)	2 (12)
Hoarseness of voice, N (%)	3 (75)	5 (29)
Bradycardia, N (%)	3 (75)	–

Fig. 2: Status of TPO antibody positivity among elderly with thyroid dysfunction

All the patients suspected to be suffering from thyroid disorders had easy fatigability (100%) and generalised weakness (100%). Almost three-fourths of those with clinical hypothyroidism had symptoms such as weight gain and constipation. Minimal symptoms suggestive of thyroid dysfunction were present among those with

subclinical hypothyroidism. Only one case of hyperthyroidism was observed among the study population and it was characterised by typical symptoms such as tremors, goitre and tachycardia (Table 3).

Table 3: Lipid abnormalities and thyroid dysfunction

Mean and SD for various biochemical values of lipids in patients with and without thyroid dysfunction			
	With normal thyroid function (n=78)	With dysfunction (n=22)	P value
TGL (mean ± SD)	174.42 ± 46.44	206.32 ± 69.54	0.05
T. CHOL (mean± SD)	170.2 ± 50.42	199.44 ± 56.88	0.02
HDL (mean± SD)	43.12 ± 8.42	43.44 ± 11.01	0.89
LDL (mean ± SD)	99.77 ± 30.65	121.28 ± 47.03	0.04
Dyslipidemia (N (%))	19 (24.35%)	20 (90.90%)	<0.001

TPO antibodies were estimated in all cases with altered thyroid functions. TPO was positive in 16 cases (73%) of these cases. All patients with hypothyroidism had positive TPO antibodies,

probably indicating autoimmune cause for this disorder. Among the subclinical hypothyroid cases 12 (70.58%) were positive for TPO AB (Table 4).

Table 4: Comparison of current study findings with existing evidence

S. no	Author/ year/ place	Demographic characteristics	Overall Prevalence of Thyroid dysfunction	Type of Thyroid dysfunction	Dyslipidemia In Thyroid dysfunction
1	Present study	N=100(males=42, females=58) Age≥60 years	22%	Subclinical hypothyroidism: 17% Clinical hypothyroidism 4% subclinical hyperthyroidism: 1%	Prevalence 90.9% LDL = 121 mg/dl Total cholesterol = 199 mg/dl
2	Alamdari et al., (18) Iran	N = 5154 (20 to 90 years) mean age 39.7 ± 14.2 years	7.5%	Subclinical hypothyroidism = 5.6% Hypothyroidism 1.9%.	Subclinical Hypothyroidism LDL = 128 mg/dl Total cholesterol = 199 mg/dl
3	Cappola et al., (10) USA	N=3233 (males=40.4%, females= 59.6%) Age≥65	18%	subclinical hypothyroidism: 15% overt hypothyroidism: 1.6% subclinical hyperthyroidism: 1.5%	Subclinical Hypothyroidism LDL = 132 mg/dl Total cholesterol = 214 mg/dl
4	Chuo et al., (11) Singapore	N=184 (males= 32.3%, females=67.7%) Mean Age= 83.8 ± 6.2 years	33.7%	Hyperthyroidism: 1 (0.5%) subclinical hypothyroidism: 4 (2.2%) primary hypothyroidism: 9 (4.9%), secondary hypothyroidism: 15 (8.2%) sick euthyroid syndrome: 33 (17.9%)	-
5	Iglesias et al., (9) Spain	N= 447 patients (62% females) Age=60-101 years	13.4%	overt hypothyroidism, 14 (3.1%); subclinical hypothyroidism, 25 (5.6%); overt hyperthyroidism, 11 (2.5%), subclinical hyperthyroidism, 10 patients (2.2%)	-
6	Flatau et al., (21) cross-sectional Israel	N=751 (289 men and 462 men) 65–92 years	38%	Overt and subclinical in men: 9.7% Overt and subclinical in women: 18.2%	-
7	Gusseklou et al., (22) cohort study Netherlands	N= 558 (189 men and 369 women) ≥85 year	14%	Overt: 7.0% Subclinical: 5.0%	-
8	Wilson et al., (23) cross-sectional US	5960 (2892 men and 2980 women) ≥65 years	20%	Overt: 0.4% (men 0.4% and women 0.4%) Subclinical: 2.9% (men 2.0% and women 3.7%) Overt: 3.5% Subclinical: 7.3%	-

Patients with thyroid dysfunction had higher values of triglycerides, total cholesterol and LDL, which was found to be statistically significant (p value <0.05). Overall, 39% of the study population had dyslipidemia. The proportion of subjects with dyslipidemia was 90.90% (20/22) among the subjects with thyroid dysfunction and it was 24.35% (19/78) in normal subjects (P value < 0.001). The findings are summarised Table/fig. 5.

DISCUSSION

Thyroid disorders are common in the elderly, and are challenging to diagnose and treat due to atypical presentations and the presence of a wide variety of

comorbid conditions (7). The functional disorders of thyroid are hypothyroidism and hyperthyroidism, which could be present in an overt or subclinical form.

In the present study, the overall prevalence of hypothyroidism was 21% (17% subclinical and 4% clinical). Findings from other studies have reported a prevalence ranging from 10.95% to 28.8% (8-11). Most of these study findings varied compared to the current study. The reason could be due to different geographical location with varied sample size and different study designs and research questions. The reasons for the presence of higher levels of subclinical cases can be due to presence of nodules and atrophy of

thyroid gland with advancing age makes the clinical diagnosis difficult (7).

In the present study, the prevalence of hypothyroidism was highest in the age group of 76 to 80 years. It can also be confirmed from the previous studies that the hypothyroidism increases with increased age and hyperthyroidism is more commonly seen in younger age groups (8, 12). The cause of hypothyroidism in the elderly is mainly due to the presence of autoantibodies increase with age, and autoimmune thyroid failure (7). Iodide status in the elderly is low compared with young adults due to dietary restrictions of salt and decreased absorption due to comorbid conditions which can increase the thyroid disorders (7). Thyroidal iodine uptake decreases with age, leading to decreased T4 secretion in the elderly. This reduction in T4 secretion is compensated by decreased T4 metabolic clearance due to decreased 5'-deiodinase activity with advanced age (12). The hyperthyroidism had less prevalence in the present study, which is a diagnostic challenge in the elderly, due to its atypical presentations and atrophy of thyroid gland with advancing age (7).

In the present study, the prevalence of hypothyroidism was higher in females (25.86%) compared to males (16.67%) and these findings were consistent with findings of several other studies (8, 13). The progression in female reproductive stages over a lifetime may be associated with thyroid disorders. The changing levels of reproductive hormones throughout menstruation, pregnancy, postpartum, perimenopause, and menopause may influence susceptibility to affective disorders (13). Moreover, epidemiological data suggest a role of estrogen in the pathogenesis of thyroid diseases (14).

In the present study, subjects had complaints of easy fatigability, myalgia, weight gain, constipation, dry skin and voice hoarseness similar to other studies. Other conditions such as depression and anaemia also cause multiple overlapping symptoms such as tiredness, easy fatigability and poor memory (15). This leads to difficulty and under diagnosis of thyroid disorders among the elderly. Due to the non-specific symptoms, the diagnosis of subclinical hypothyroidism among the elderly cannot be based on clinical features.

The thyroid hormone is known to play a role in regulating the synthesis, metabolism, and the mobilisation of lipids. In patients with overt hypothyroidism, there is an increase in serum total cholesterol, low-density lipoprotein (LDL) cholesterol, apolipoprotein B, lipoprotein levels, and possibly, triglyceride levels (16). Subjects with subclinical hypothyroidism also had dyslipidaemia, similar to other studies (17). In the present study, the patients with thyroid dysfunction had higher values of triglycerides, total cholesterol and LDL. Overall, 39% of the study population had dyslipidemia. Similarly,

various other studies had reported an association between dyslipidemia and thyroid dysfunction (18-20).

The benefits of identifying thyroid disorders among the elderly are multi-fold. In addition to improving the depressive symptoms, studies have identified that there is a beneficial effect on the LDL level and the clinical features such as myalgia. Also, symptoms such as tiredness, lab parameters such as LDL cholesterol and endothelial dysfunction improved after thyroxine supplementation among the elderly (17). This will enable the reduction of mortality and morbidity among the elderly.

LIMITATIONS

The key limitation of the study was cross-sectional study design; thus, the observed association cannot be interpreted as causal inferences. The present study was conducted single setting with limited sample size and purposive sampling technique was employed. Hence the generalizability of the study findings is limited.

CONCLUSION

Subclinical hypothyroidism is found to be highly prevalent in the geriatric age group. It is often underdiagnosed due to the non-specific symptoms. Laboratory tests can aid in the diagnosis of hypothyroidism among the elderly, but not feasible to be performed on everyone. Identifying the geriatric individuals who have symptoms suggestive of hypothyroidism and screening them will be more beneficial in diagnosis. Untreated subclinical hypothyroidism can progress to overt hypothyroidism and also increases the risk of cardiovascular and neurological diseases. Identifying the epidemiology and clinical features of thyroid disorders among the elderly will enable develop guidelines such as the criteria for screening, clinical assessment, early diagnosis and management. This, in turn, will improve the quality of life among the elderly and also in reduction of mortality and morbidity.

ACKNOWLEDGEMENTS

We acknowledge the technical support in data entry, analysis and manuscript editing by "Evidence Research Associates".

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Cire, B. World's older population grows dramatically [Internet]. Maryland: National Institutes of Health; 2016 [updated 2016/03/28; cited 2019 Sep 10]. Available from: <https://www.nih.gov/news-events/news-releases/worlds-older-population-grows-dramatically>.
2. Talwalkar, P., Deshmukh, V., Bhole, M. Prevalence of hypothyroidism in patients with type 2 diabetes mellitus and hypertension in India: a cross-sectional observational study. *Diabetes Metab Syndr Obes*. 2019; 12: 369-376.

3. Gesing, A., Lewiński, A., Karbownik-Lewińska, M. The thyroid gland and the process of aging; what is new? *Thyroid Res.* 2012; 5(1): 16.
4. Boelaert, K. Thyroid dysfunction in the elderly. *Nat Rev Endocrinol.* 2013; 9(4): 194-204.
5. Diez, J. J., Iglesias, P. Spontaneous subclinical hypothyroidism in patients older than 55 years: an analysis of natural course and risk factors for the development of overt thyroid failure. *J Clin Endocrinol Metab.* 2004; 89(10): 4890-4897.
6. Kumar, H., Singh, V., Meena, B., Gaur, S., Singla, R., Sisodiya, M. Clinical profile of thyroid dysfunction in elderly: An overview. *Thyroid Research and Practice.* 2016; 13(3): 101.
7. Ajish, T. P., Jayakumar, R. V. Geriatric thyroidology: An update. *Indian J Endocrinol Metab.* 2012; 16(4): 542-547.
8. Unnikrishnan, A. G., Kalra, S., Sahay, R. K., Bantwal, G., John, M., Tewari, N. Prevalence of hypothyroidism in adults: An epidemiological study in eight cities of India. *Indian J Endocrinol Metab.* 2013; 17(4): 647-652.
9. Iglesias, P., Munoz, A., Prado, F., Guerrero, M. T., Macias, M. C., Ridruejo, E., *et al.*, Alterations in thyroid function tests in aged hospitalized patients: prevalence, aetiology and clinical outcome. *Clin Endocrinol (Oxf).* 2009; 70(6): 961-967.
10. Cappola, A. R., Fried, L. P., Arnold, A. M., Danese, M. D., Kuller, L. H., Burke, G. L., *et al.*, Thyroid status, cardiovascular risk, and mortality in older adults. *JAMA.* 2006; 295(9): 1033-1041.
11. Chuo, A. M., Lim, J. K. Thyroid dysfunction in elderly patients. *Ann Acad Med Singapore.* 2003; 32(1): 96-100.
12. Hollowell, J. G., Staehling, N. W., Flanders, W. D., Hannon, W. H., Gunter, E. W., Spencer, C. A., *et al.*, Serum TSH, T(4), and thyroid antibodies in the United States population (1988 to 1994): National Health and Nutrition Examination Survey (NHANES III). *J Clin Endocrinol Metab.* 2002; 87(2): 489-499.
13. Bauer, M., Glenn, T., Pilhatsch, M., Pfennig, A., Whybrow, P.C. Gender differences in thyroid system function: relevance to bipolar disorder and its treatment. *Bipolar Disord.* 2014; 16(1): 58-71.
14. Manole, D., Schildknecht, B., Gosnell, B., Adams, E., Derwahl, M. Estrogen promotes growth of human thyroid tumor cells by different molecular mechanisms. *J Clin Endocrinol Metab.* 2001; 86(3): 1072-1077.
15. Compton, W. M., Conway, K. P., Stinson, F. S., Grant, B. F. Changes in the prevalence of major depression and comorbid substance use disorders in the United States between 1991-1992 and 2001-2002. *Am J Psychiatry.* 2006; 163(12): 2141-2147.
16. Pearce, E. N. Hypothyroidism and dyslipidemia: modern concepts and approaches. *Curr Cardiol Rep.* 2004; 6(6): 451-456.
17. Razvi, S., Ingoe, L., Keeka, G., Oates, C., McMillan, C., Weaver, J. U. The beneficial effect of L-thyroxine on cardiovascular risk factors, endothelial function, and quality of life in subclinical hypothyroidism: randomized, crossover trial. *J Clin Endocrinol Metab.* 2007; 92(5): 1715-1723.
18. Alamdari, S., Amouzegar, A., Tohidi, M., Gharibzadeh, S., Kheirkhah, P., Kheirkhah, P., *et al.*, Hypothyroidism and Lipid Levels in a Community Based Study (TTS). *Int J Endocrinol Metab.* 2016; 14(1): e22827.
19. Guntaka, M., Hanmayyagari, B., Rosaline, M., Nagesh, V. Lipid profile in subclinical hypothyroidism: A biochemical study from tertiary care hospital. *CHRISMED Journal of Health and Research.* 2014; 1(4): 266-270.
20. Jayasingh, I., Puthuran, P. Subclinical hypothyroidism and the risk of hypercholesterolemia. *Journal of Family Medicine and Primary Care.* 2016; 5(4): 809-816.
21. Flatau, E., Trougouboff, P., Kaufman, N., Reichman, N., Luboshitzky, R. Prevalence of hypothyroidism and diabetes mellitus in elderly kibbutz members. *Eur J Epidemiol.* 2000; 16(1): 43-46.
22. Gussekloo, J., van Exel, E., de Craen, A.J., Meinders, A.E., Frölich, M., Westendorp, R. G. Thyroid status, disability and cognitive function, and survival in old age. *Jama.* 2004; 292(21): 2591-2599.
23. Wilson, S., Parle, J. V., Roberts, L. M., Roalfe, A. K., Hobbs, F. D., Clark, P., *et al.*, Prevalence of subclinical thyroid dysfunction and its relation to socioeconomic deprivation in the elderly: a community-based cross-sectional survey. *J Clin Endocrinol Metab.* 2006; 91(12): 4809-4816.