

CLINICAL AND BIOCHEMICAL EVALUATION OF THYROID DYSFUNCTION IN ELDERLY: A RELATIONSHIP BETWEEN WAYNE'S AND ZULEWSKI CLINICAL SCORES WITH THYROID DISORDERS

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ABSTRACT

Objectives: The objectives of this study were to know the burden and spectrum of thyroid dysfunction in elderly population and to find out the relationship between Wayne's and Zulewski clinical scores with thyroid disorders.

Methods: This prospective cross-sectional study was conducted at tertiary care teaching hospital of Rajasthan only after approval from the Institutional Ethics Committee. The study participants consist of elderly patients of age 60 years and above. Wayne's and Zulewski clinical score were used for the diagnosis of hypothyroidism and hyperthyroidism, respectively, and goiter was evaluated by the WHO classification. All the participants were subjected to biochemical test TSH and if required total T3, T4, thyroid antibody (Anti-TPO test), and USG/FNAC neck.

Results: Total 165 patients were studied during the study period. The prevalence of thyroid disorders was 16.36%. The sensitivity of Zulewski clinical scores was 100% for both hypothyroid and overt hypothyroid patients, while the specificity was 58.39% and 54.72%, respectively, in cases of hypothyroidism and overt hypothyroid patients. The sensitivity of Wayne clinical scores for hyperthyroid was 33.33%, while specificity was 100%.

Conclusions: The present study concluded that thyroid dysfunction is common among elderly and hypothyroidism is more common than hyperthyroidism. Clinically, we can suspect thyroid disorder, but, biochemically, thyroid function test is always being a gold standard to diagnose the disease.

Keywords: Wayne's clinical scores, Zulewski clinical scores, Thyroid dysfunction, Goiter, Biochemical.

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INTRODUCTION

Thyroid disorders are the most common endocrine disorder worldwide including India. About 42 million people in India suffer from thyroid diseases [1]. The most common identified thyroid diseases are hypothyroidism, hyperthyroidism, goiter, hashimoto's thyroiditis, and thyroid cancer. In elderly population, thyroid gland dysfunction is common which leads to increase in morbidity, if not treated.

As the age advances thyroid gland under goes light physiological changes. Epidemiologic studies have shown a remarkable increase in the incidence and prevalence of thyroid disorders in older populations [2]. About 10% of the females and 2% of the males of age more than 60 have hypothyroidism. In younger population, hyperthyroidism is more common, in elderly population, the prevalence of hyperthyroidism is about 2%, but some studies show 10-15% of the patients with hyperthyroid that is more older than 60 years of age [3].

In elderly, the classical symptoms of thyroid dysfunction were absent and not easily recognizable; therefore, it is often overlooked or misdiagnosed. Interpretation of thyroid function tests in older adults is difficult due to the age-dependent physiologic changes in thyroid function, coexistent chronic illness, and poly-pharmacy [4]. The management of thyroid is orders in older adults, which remains controversial.

There is conflicting literature regarding the approach. Despite the ongoing debate, current guidelines suggest, considering treatment on an individual basis according to symptoms, and possible treatment benefit [5]. However, in older patients, the risk of harm from treatment complicates the decision-making process.

The potential results of subclinical hypothyroidism are much less well established and an elevated TSH in the elderly has been recently suggested as addressing a mortality advantage. Very few studies from this part of India have been reported relationship between Wayne's and Zulewski clinical scores and biochemically diagnosed thyroid disorders in elderly patients. Hence, this study was undertaken to know the burden and spectrum of thyroid dysfunction in elderly population.

METHODS

This prospective cross-sectional study was conducted at Geetanjali Medical College and Hospital, Udaipur (Rajasthan) only after approval from the Institutional Ethics Committee. The study participants consist of elderly patients of age 60 years and above for a period of 1 and 1/2 year who attended outpatient department of General Medicine and free general health checks up camp at Geetanjali Hospital, Udaipur. A written informed consent was taken from all the enrolled patients.

Inclusion criteria

All aged 60 years and above were included in the study patients.

Exclusion criteria

All patients who were critically sick, patients with established thyroid disorders, patients on thyroid supplements and drugs known to alter the thyroid functions (such as lithium and steroids), patients who had under gone thyroid surgery or taken radioactive iodine therapy, patients on iodine containing vitamins or minerals, and patients evaluated with radio logical tests using contrast media in the recent past were excluded out from the study.

Procedure

All enrolled subjects were subjected to detailed clinical examination. A detailed medical history and physical examination was conducted. All the participants were subjected to TSH and if required total T₃, T₄, thyroid antibody (Anti-TPO test), and USG/FNAC neck were performed. CBC, RBS, ECG, and ECHO were also done, if required. The laboratory evaluation of thyroid function was done by estimation of serum TSH levels by Chemiluminescence assay method. TPO antibody was estimated using Chemiluminescence method. Two milliliters of blood were drawn and centrifuged and serum (500 µl) collected from that and incubated with the reagent (separate for T₃, T₄, and TSH) for 1 h at room temperature. Later, the readings were taken from the instrument COBASE411.

When the values of T₃ and T₄ are low and TSH is high, it is considered to be hypothyroidism. If T₃ and T₄ are normal and only TSH is elevated; then, it is considered to be subclinical hypothyroidism. If values of T₃ and T₄ increase and TSH is reduced, it is considered as hyperthyroidism. If values of T₃ and T₄ are normal and only TSH is reduced from normal values, then it is considered to be subclinical hyperthyroidism. FNAC of thyroid was performed under aseptic conditions using a 10 ml sterile syringe and 22-24G needle; aspirates were taken from two different sites of the thyroid gland. Aspirates were smeared over the glass slide and covered by a coverslip of 0.4 mm thickness. The slide was dipped in the container containing the fixative 70% to 90% ethanol. Later, the slide was studied under the high power microscope (40×) and finally the reporting was done by the pathologist. USG of thyroid was performed using GE Voluson E8 Surface probe, machine with the probe frequency of 8-12MHz.

Clinical evaluation of thyroid function

Wayne's [6] and Zulewski [7] clinical scores were used for the diagnosis of hypothyroidism and hyperthyroidism, respectively, and goiter was evaluated by the WHO classification [8].

Table 1: General characteristics of the study population (n=165)

	Mean±SD or n(%)
Height.(cm)	161.79±4.84
Weight (Kg)	71.14±10.91
BMI (Kg/m ²)	27.22±4.33
Pulse (beats/min)	78.89±11.20
Systolic blood pressure (mm/Hg)	128.50±13.79
Diastolic blood pressure (mm/Hg)	82.32±9.48
Age group (years)	
60-65	72 (43.64%)
66-70	49 (29.70%)
>70	44 (26.67%)
Sex distribution	
Male	101 (61.21%)
Female	64 (38.79%)
Comorbidities	
Hypertension	54 (32.73%)
Obesity	43 (26.06%)
Diabetes mellitus	40 (24.24%)
Thyroid disorder	27 (16.36%)
Ischemic heart disease	7 (4.24%)

Statistical analysis

The collected data were recorded in an excel sheet and analyzed by mathematical process for concluding the result to meet the research objectives. Categorical variables were summarized as frequency and percentage and were analyzed using the Chi-square test. Continuous variables were summarized as mean and standard deviation and were analyzed using the t-test. p<0.05 was taken as statistically significant.

RESULTS

Total 165 patients were studied during the study period. The male/female ratio was 1.58. The mean height of the elderly patients was 161.79±4.84 cm, weight was 71.14±10.91 kg. The mean value of BMI was 27.22±4.33kg/m². The mean value of pulse was 78.89±11.20 beats/min. The mean systolic and diastolic blood pressure was 128.50±13.79 and 82.32±9.48 mm/Hg, respectively. There was maximum number of cases (32.73%) of hypertension reported, while least number of cases was seen in patients with ischemic heart disease (4.24%). The prevalence of thyroid disorders was 16.36% (Table 1).

BMI in thyroid males was 26.45 kg/m² and in females, it was 28.86 kg/m². Hypothyroidism was observed in 16 (9.7%) cases, while hyperthyroidism was observed merely in 3 (1.82%) patients out of 165 patients. Goiter, a thyroid dysfunction, was seen in eight elderly patients. While grade 1 goiter was seen only in 3 (1.82%) cases, while grade 2 goiter was observed in 5 (3.03%) cases (Table 2).

Cases with <11 scoring were considered as euthyroid which was seen in 158 (95.76%) cases. Equivocal hyperthyroidism was seen in 6 (4.24%) cases with scoring between 11 and 19, while toxic hyperthyroidism where the scoring was more than 19 was observed only in 1 case (0.60%) according to Wayne's scoring. Seventy-eight (47.27%) cases of hypothyroidism (scoring >5), 36 (21.82%) cases were registered as euthyroid (scoring 0-2), whereas 51 (30.91%) considered as intermediate (scoring 3-5) according to Zulewski scoring (Table 3).

Dry skin and weight gain were in maximum number of cases (87.50%) of hypothyroidism used in Zulewski scoring. On physical examination, cold skin (87.50%) was observed in maximum number of cases followed by coarse skin in 62.50% cases (Table 4).

All the patients reported with dyspnea on exertion, palpitations, tiredness, preference for heat, excessive sweating, and nervousness of hyperthyroidism used in Wayne scoring. On physical examination, all patients reported with palpable thyroid and hot hands, where 66.67% cases reported with moist hand (Table 4).

The sensitivity of Zulewski clinical scores was 100% for both hypothyroid and overt hypothyroid patients, while the specificity was 58.39% and 54.72%, respectively, in cases of hypothyroidism and overt hypothyroid patients. p value was also found significant in both the cases (Table 5).

The sensitivity of Wayne clinical scores for hyperthyroid was 33.33%, while specificity was 100%. The accuracy of the test was found 98.79%. p value was also found significant (Table 5).

Table 2: Spectrum of thyroid disorder biochemically in elderly patients (n=165)

Thyroid disorders	Types of thyroid disorders	n (%)	Total=27 (16.36%)
Hypothyroidism	Subclinical Hypothyroidism	10 (6.06%)	16 (9.7%)
	Overt Hypothyroidism	6 (3.64%)	
Hyperthyroidism	Subclinical Hyperthyroidism	2 (1.21%)	3 (1.82%)
	Overt Hyperthyroidism	1 (0.61%)	
Goiter	Euthyroid	5 (3.03%)	8 (4.84%)
	Hyperthyroid	2 (1.21%)	
	Hypothyroid	1 (0.60%)	

DISCUSSION

Subclinical thyroid dysfunction is a biochemical diagnosis and patients have few clinical sign or symptoms of thyroid dysfunction [9]. The clinical and biochemical profile is not well defined, especially in Indian scenario. The present study showed some variations in the pattern of the disease as compared to others studies. It may be due to variation in sample size or ethnic variation.

Babiarczyk and Turbiarz study in elderly patients showed 27.76±5.34 kg/m² mean value of BMI [10]. Akbar et al. study observed 29.5±5.3 kg/m² BMI for hypothyroid females [11]. In present study, the mean value of BMI was 27.22±4.33 kg/m² which was similar to the above study. This much BMI in patients is classified as overweight according to the WHO criteria. Hence, patients of thyroid disorders are overweight as compared to normal people.

In the study performed by Cappola et al. of elderly, patients showed that total thyroid abnormalities accounted to be 18.33%, in which female had a share of 13.9%, while males were 4.43% [12]. Where

in Hintze et al. conducted a study on elderly patients in North-west Rajasthan and concluded that total thyroid abnormalities were seen in 19.1% in which females were 18.1% while males were 17.4% [13]. Whereas, in the present study, the total thyroid abnormalities were found in 16.36% cases, in which females were 9.70% and males were 6.66% which was closely similar with the above studies. The results of present study and other studies proved that thyroid disorders are more common in female patients. The present study also reported other comorbidities in elderly patients which were very much similar like other studies reports [14-16].

About 3% had grade 2 goiters and 2% had grade 1 goiter in the present study. Goiter was associated either with hypothyroidism, hyperthyroidism, and euthyroid. The prime reason was iodine deficient diet. In a study performed by Vander et al. on elderly, subjects in Framingham showed thyroid nodules in 6.4% of women and 1.5% of men. The prevalence of single thyroid nodules was 3% and multinodular goiter was 1% which was similar to the present study [17].

A study conducted by Iglesias et al. showed a prevalence of about 6% cases of subclinical hypothyroidism, 3.1% cases of overt hypothyroidism, 2.2% subclinical hyperthyroidism, and 5% overt hyperthyroidism cases [18]. Another study conducted by Cappola et al. showed a prevalence of about 15% cases of subclinical hypothyroidism, 1.6% cases of overt hypothyroidism, 1.5% cases of subclinical hyperthyroidism, and 0.23% cases of overt hyperthyroidism [12]. The above-mentioned studies were similar to the present study, where subclinical hypothyroidism was found in 6.06% cases, about 3.64% of the study population had overt hypothyroidism and 1.21% had subclinical hyperthyroidism, while overt hyperthyroidism was observed in 0.61%.

In the present study, most common clinical feature used in Zulewski score for hypothyroid state was weight gain (87.50%) and dry skin

Table 3: Spectrum of thyroid disorder clinically by Wayne’s scoring and Zulewski scoring

Clinical scoring	n(%)
Wayne’s scoring	
Euthyroidism (<11)	158 (95.76%)
Equivocal hyperthyroidism (11–19)	6 (4.24%)
Toxic hyperthyroidism (>19)	1 (0.60%)
Zulewski scoring	
Hypothyroidism (>5)	78 (42.27%)
Euthyroidism (0–2)	36 (21.82%)
Intermediate (3–5)	51 (30.91%)

Table 4: Physical signs and Symptoms as per Zulewski Score and Wayne score

Zulewski score in subclinical and overt hypothyroidism (n=16)				Wayne score in subclinical and overt hyperthyroidism (n=3)			
Symptoms		Physical sign		Symptoms		Physical Sign	
Dry skin	14 (87.50%)	Cold skin	14 (87.50%)	Dyspnea/exertion	3 (100%)	Palpable thyroid	3 (100%)
Weight increase	14 (87.50%)	Coarse skin	10 (62.50%)	Palpitations	3 (100%)	Bruit over thyroid	0
Constipation	13 (81.25%)	Delayed anklereflex	8 (50.00%)	Tiredness	3 (100%)	Exophthalmoses	1 (33.33%)
Paresthesia	12 (75.00%)	Slow movement	2 (12.50%)	Preference for heat	3 (100%)	Lid retraction	0
Hoarseness	8 (50.00%)	Periorbital puffiness	2 (12.50%)	Excessive sweating	3 (100%)	Lid Lag	0
Diminished sweating	5 (31.25%)			Nervousness	3 (100%)	Hyperkinetic movement	1 (33.33%)
Hearing impairment	4 (25.00%)			Preference for cold	2 (66.67%)	Hands hot	3 (100%)
				Weight decreased	2 (66.67%)	Hand Moist	2 (66.67%)
				Appetite increased	1 (33.33%)		
				Appetite decreased	0		
				Weight increased	0		

Table 5: Relationship between clinical scores with thyroid disorders

	Hypothyroid biochemically and Zulewski clinical scores (%)	Overt hypothyroid biochemically and Zulewski clinical scores ()	Hyperthyroid biochemically and Wayne clinical scores
p-value	<0.001	0.008	<0.001
Sensitivity	100.00	100.00	33.33%
Specificity	58.39	54.72	100.00%
Positive predictive value (PPV)	20.51	7.69	100.00%
Negative predictive value (NPV)	100.00	100.00	98.78%
False negative	0.00	0.00	66.67%
True negative	58.39	54.72	100.00%
Accuracy	62.42	56.36	98.79%

(87.50%). The most common physical sign of hypothyroidism in the present study was cold skin in 87.50% cases, whereas Doucet *et al.* study reported easy fatigability (67%) as the most common clinical feature and sign [19]. Madhuvan *et al.* also showed easy fatigability, generalized weakness in all patients, dry skin is seen in half of the patients, hoarseness is in 1/4th of the patients, weight gain in 35%, delayed ankle reflex in 45%, and edema in 45% cases which was nearly similar to the present study [20]. The present study on Wayne scoring system showed dyspnea on exertion, palpitations, tiredness, excessive sweating, palpable thyroid, hands hot, and nervousness in all cases, while exophthalmoses, increased appetite, hyperkinetic movement were observed in 33.33% cases and preference for cold and weight decrease were seen in 66.67% cases. On comparison of our study for the signs and symptoms of hyperthyroidism with Doucet *et al.* study which showed fatigue in 56%, weakness in 27%, weight loss in 50% [19]. A similar study was performed by Madhuvan *et al.* which showed fatigue and weakness in 100% cases, increased appetite in 80% cases, and palpitations in 60% cases [20]. Thus, the present study was in compliance with the above studies.

Limpawattana *et al.* conducted a study to compare the clinical features of hyperthyroidism in geriatric patients. According to their study, more significant clinical presentation in the elderly group was weakness and anorexia, whereas exophthalmos, goiter and heat intolerance were not common signs and symptoms [21]. This was similar to the present study, where the weakness and anorexia were the common and exophthalmos was the rare finding.

In the present study, correlation between clinical scoring for hypothyroidism and hyperthyroidism with biochemical parameters was done. The specificity and sensitivity test of the present study was performed between Zulewski scoring of clinical symptoms and sign with biochemical tests of hypothyroid patients which revealed that the sensitivity was 100%, while the specificity was 58.39%. The accuracy of the test was 62.42%, wherein the study performed by Zulewski *et al.* had sensitivity 62%, specificity 99%, and the accuracy that were 62% which was similar to present study [7]. The present study results can also be related with the study conducted by Canaris *et al.* which stated that based on the severity of symptoms and TSH tests, the number of symptoms were correlated weakly with TSH ($r=0.35$, $p<0.001$) [22]. This significant p value means that clinical assessment by Zulewski scoring was a sensitive tool for the diagnosis of hypothyroidism and overt hypothyroidism but not as confirmatory tests, so biochemical test was preferred over clinical scoring.

Study conducted by Crooks *et al.* showed that the diagnostic accuracy for Wayne index was 85%, [23] whereas in the present study, a specificity and sensitivity test for Wayne index was 33.33% and 100%, respectively. The accuracy of the test was 98.79%. p value was also significant. It explains that Wayne's scoring is used for grading of toxic hyperthyroidism which is as confirmative as biochemical test.

CONCLUSIONS

The present study concluded that thyroid dysfunction is common among elderly and hypothyroidism was more common than hyperthyroidism. Clinically, we can suspect thyroid disorder, but, biochemically, thyroid function test is always being a gold standard to diagnose the disease. As the age advances thyroid disorder increases. A strong clinical suspicion of thyroid disease should be considered in elderly patients who presented with vague symptoms like generalized weakness, easy fatigability, lethargy, and disinterest in daily activities.

AUTHORS' CONTRIBUTIONS

All the authors contributed to the preparation of the final manuscript.

CONFLICTS OF INTEREST

None.

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Nil.

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