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EFFECT OF VITAMIN D ON THE OXIDATIVE STRESS PARAMETER (MDA) IN HYPOTHYROID PATIENTS

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Oxidative stress, Vitamin D, Hypothyroidism, TSH (Thyroid Stimulating Hormone), T3 (Tri-iodothyronine), T4 (Thyroxine), Malondialdehyde (MDA)

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ABSTRACT: Background: Hypothyroidism is a metabolic disorder. Vitamin D is known to improve the impact of autoimmune diseases; hence, vitamin D supplements and adjuvant therapy can improve hormonal and metabolic imbalance along with oxidative stress. The study aims to determine the effect of Vitamin D on the oxidative stress parameter in hypothyroid patients compared to controls and hypothyroid subjects before and after vitamin D therapy. **Methods:** A prospective study of six months period was carried out among 120 subjects attending the General Medicine department. Age and gender-matched euthyroid controls (n=40) and patients who were newly diagnosed as hypothyroid (with increased serum TSH and or with decreased serum T_3 or T_4levels) were taken as cases (n=80). Serum TSH (mμ/L), T_3(pg/m), and T_4(ng/dl) levels were compared. Oxidative stress parameter (MDA) in hypothyroid patients is a tool to assess oxidative stress levels it was measured by using the Immunoassay method. **Results:** Oxidative stress parameter (MDA) in hypothyroid with and without vitamin D supplementation showed improvement indicating decreased levels in oxidative stress, along with statistical significance ($p<0.001$*). Oxidative stress parameter (MDA) in hypothyroid subjects as per serum TSH, T_3, and T_4 levels with and without Vitamin D supplementation showed significant improvement. **Conclusion:** Prevalence of Hypothyroidism was displayed in females. An increase in oxidative stress parameter (MDA) level in hypothyroid subjects indicates an increase in oxidative stress levels in hypothyroid patients. Oxidative stress parameter (MDA) in hypothyroid subjects as per TSH, T_3 & T_4 levels with and without Vitamin D supplementation showed a significant change.

INTRODUCTION: Hypothyroidism is a clinical condition in which reduced thyroid action was observed due to a dysfunctional thyroid gland [1, 2]. The thyroid hormone controls and affects an innumerable number of metabolic functions in the body [3] along with cardiovascular, reproductive, nervous, and pulmonary systems in the human body [4].

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Metabolic disorders like hypothyroidism bring evident alterations in oxidative stress levels in the system [5]. Oxidative stress is a disbalance between the free radicals production and antioxidant defense mechanisms and is accountable for damage to tissues in some metabolic ailments [6].

Hypothyroidism-induced dysfunction in the body leads to the free radicals production [7]. Affected metabolic conditions from hypothyroidism can also rise oxidative stress levels. Malondialdehyde (MDA), is a biomarker of oxidative stress and hence the oxidative stress levels in hypothyroid patients can be identified by using it as a means [8]. Vitamin D is one of the vital managers of hormonal and metabolic imbalance and oxidative stress [9, 10].

In turn, affecting antioxidant defense mechanisms and tissue damage. Hence, vitamin D supplement and adjuvant therapy can improve hormonal and metabolic imbalance and oxidative stress [11]. Our study aims to determine the effect of Vitamin D on the oxidative stress parameter in hypothyroid patients compared to controls and hypothyroid subjects with and without vitamin D therapy.

METHODS: A prospective study of six months period was carried out among 120 subjects attending the General Medicine department of Shadan Institute of Medical Sciences. Age and gender-matched euthyroid controls and subjects who were diagnosed as hypothyroid were included as cases. Six-month vit –D supplementation was given to the subgroup and thyroid therapy. Study conducted after ethical approval 069/SIMS/admin/2019.

Group Allocation: 120 subjects were divided into two study groups.

Group-1 (Controls): Healthy individuals - (n=40).

Group -2 (Cases): (n=80).

Subgroup A(n=40): With vit D supplementation cases.

Subgroup B(n=40): Without vit D supplementation cases.

Inclusion Criteria: Controls and recently diagnosed hypothyroid subjects.

Exclusion Criteria: Subjects having comorbidities like cardiac, renal, pulmonary, and diabetes mellitus and smokers and alcoholics were excluded.

Investigations Done:
Thyroid Profile (TSH): Immunoassay method.

Vitamin D: Mini vidaas method.

Malondialdehyde (MDA): After 10-12 h of blood samples (fasting) were collected, and serum was separated.

Statistical Analysis: SPSS software was used to analyze data through the following tools a) Descriptive analysis, b) Student t-test, and c) ANOVA.

RESULTS: The study subjects were grouped into the controls group (Healthy individuals, n=40) and cases group (n=80), subjects other than controls who participated were newly diagnosed as hypothyroid. Among cases, 80 subjects (mean age 15-45 years), the female majority was observed with a significant change of BMI between the groups' **Table 1.**

TABLE 1: DEMOGRAPHIC AND BIOCHEMICAL PARAMETERS IN CONTROLS AND HYPOTHYROID CASES

Parameters	Controls (n=40)	Cases (n=80)
Age (15-45years)	23.73±6.38	30.18±7.74
Gender (Male/Female)	12/28	53/67
BMI (kg/m2)	20.52±4.29	29.20±4.20
Serum Vit-D (ng/ml) levels	38.85±4.27	24.70±6.84
Serum TSH (mμ/L) levels	5.87±2.38	15.45±3.62
Serum T_3 (pg/ml) level	3.20±2.32	1.35±0.12
Serum T_4 (ng/dl) levels	10.65±8.51	5.20±4.11
Malondialdehyde (MDA)	19.0±4.12	59.8±6.27

Data represented as Mean±SD. BMI (Body Mass Index), TSH-Thyroid stimulating hormone, T3 (Tri-iodothyronine), T4 (Thyroxine), Malondialdehyde (MDA).

Table 2 depicts the effect of vitamin D on TSH, T_3, and T_4 levels in hypothyroid subjects, where the study subjects were compared with and without vitamin d supplementation for 6 months of the treatment period. In TSH level (mμ/L) not much change was noticed with and without vitamin D supplementation (with-5.87±2.38 and without-4.45±3.62, but a significant change was observed in T_3 level (pg/ml) (with- 3.20±2.32 and without-1.35±0.12) and in T_4 level (ng/dl) (with-10.65±8.51 and without- 5.20±4.11) with a statistical significance ($p<0.001$*).

Oxidative stress parameter (MDA) in hypothyroid subjects, with and without vitamin D supplementation, showed a remarkable significance (with-22.91±0.82 and without- 43.68±1.08), with a statistical significance ($p<0.001$*) **Fig. 1.**

TABLE 2: EFFECT OF VITAMIN D ON TSH, T3 AND T4 LEVELS IN HYPOTHYROID SUBJECTS

Serum TSH (mμ/L)		Serum T3 (ng/ml) levels		Serum T4 (μg/dl) levels	
NO Vit D Supp	with Vit D Supp	NO Vit D Supp	With Vit D Supp	NO Vit D Supp	WithVit D Supp
5.87±2.38	4.45±3.62	1.35±0.12	3.20±2.32	5.20±4.11	10.65±8.515
p value- 0.014		p value- <0.001*		p value- <0.001*	

Data are in Mean± SD, SD- standard deviation, * represents statistical significance.

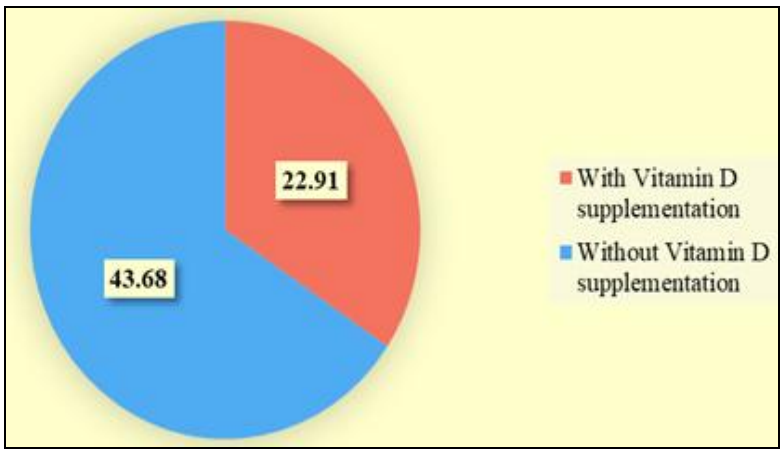

FIG. 1: OXIDATIVE STRESS PARAMETER (MDA) IN HYPOTHYROID SUBJECTS, WITH AND WITHOUT VITAMIN D SUPPLEMENTATION

DISCUSSION: We conducted this study to discover the effect of Vitamin D on the oxidative stress parameter (MDA) in hypothyroid patients.

In this study, 120 subjects participated, healthy controls (n=40) and as cases (80), respectively. The study population showed a female majority. In a similar study by Mammen JSR *et al.*, thyroid dysfunction was more common in women.[12] BMI calculations exhibited significant change between the study groups. It was also reported by Ríos-Prego M *et al.* and Bakiner O *et al.*, [13, 14] in their respective studies. In the current study, the Oxidative stress parameter (MDA) in hypothyroid subjects with and without vitamin D supplementation showed significant improvement indicating decreased levels of oxidative stress [15], along with statistical significance (p<0.001*).

Oxidative stress parameter (MDA) in hypothyroid subjects, as per T_3 and T_4, with and without Vitamin D supplementation, showed a remarkable significance.

CONCLUSION: Our study reveals that hypothyroidism is prevalent in females. It also illustrates that an increase in oxidative stress parameter (MDA) levels in hypothyroid subjects it indicates increased oxidative stress levels in subjects. The oxidative stress parameter (MDA) as per T_3 and T_4levels, in hypothyroid subjects, with and without Vitamin D supplementation, revealed a noteworthy significance, and the TSH levels were within the optimal range.

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CONFLICTS OF INTEREST: Authors declare no conflicts of interest.

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