



Analysis of anti oxidant status in varying age groups of hypothyroid patients in Bangalore

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ABSTRACT

Hypothyroidism is a progressive metabolic disorder associated with decreased levels of T3 and T4 and increased TSH level. It is a common disease seen in females compared to males. Hypothyroidism being a metabolic disorder is associated with oxidative stress, which involves generation of free radicals. The thyroid gland produces H_2O_2 by NADPH Oxidase system of the membrane and it utilizes H_2O_2 as a substrate of thyroid peroxidase (TPO) for thyroid hormone formation. In the present study T3, T4 and TSH was estimated to establish hypothyroidism and MDA and vitamin C to assess the oxidative stress and anti-oxidant status respectively in the individuals. The study revealed an increased level of malondialdehyde (MDA) and a significant depression in antioxidant status.

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Introduction

Primary hypothyroidism measures the amount of Thyroid stimulating hormone (TSH) being produced. High levels of TSH indicate that the thyroid is not producing sufficient levels of thyroid hormone (mainly as thyroxine (T4) and smaller amounts of triiodothyronine (T3).

Hypothyroidism being a metabolic disorder is associated with oxidative stress, which involves generation of free radicals. (Mazzaferri E.et.al)

Malgorzata M. Dobrzynstr et. al also found in their studies that as thyroid hormones increase metabolic activity and oxygen consumption causing oxidative stress in exposed cells and generation of free radicals.

Free radicals play an important role in a number of biological processes, some of which are necessary for life, such as the intracellular killing of bacteria by neutrophil granulocytes. (B. Halliwell et.al)

Free radicals have also been implicated in certain cell signaling processes. The two most important oxygen centered free radicals are superoxide and hydroxyl radical. They are derived from molecular oxygen under reducing conditions. However because of their reactivity, these same free radicals can participate in unwanted side reactions resulting in cell damage. (Balthasar, D.Met.al)

Masahiro Sugawara et. al found in their studies that there is generation of oxygen free radicals in thyroid cells and inhibition of thyroid peroxidase.

Free radicals and Antioxidants:

Cells generate energy by reducing molecular oxygen to water. During this process, small amounts of partially reduced reactive oxygen forms are produced as an unavoidable by product of mitochondrial respiration. Some of these forms are free radicals that can damage lipids, proteins, and nucleic acids. They are referred to as reactive oxygen species (ROS). An imbalance between free radical generating and radical scavenging systems results in oxidative stress, a condition that

has been associated with the cell injury seen in many pathologic conditions.

Bisbi, R.H and Parker, A.W. found in their study in 1995 that singlet oxygen reacts with proteins, nucleic acids and cellular lipids and can therefore damage the biological systems.

Arima R et al found in their study that the radical attack operated by an initiator usually follows the following general path.



Antioxidants: Which either block the initiation of free radical formation or inactivate (e.g. scavenge) free radicals and terminate radical damage. Examples are the ascorbic acid (vitamin C), lipid soluble vitamins E and A as well as glutathione in the cytosol. (Alvare Z, J.Get.al)

Materials and methods:

Inclusion Criteria:

Patients clinically detected to be having hypothyroidism.

Exclusion Criteria:

Individuals suffering from Diabetes mellitus, HIV, kidney diseases, liver diseases & tuberculosis and individuals on antioxidant supplementation.

A total of 27 samples of hypothyroid patients were collected and were matched with the equal number of subjects of the control group. All the patients selected were females in the age group 20-60 yrs.

Blood sample was collected & estimations included T3, T4 and TSH levels to establish hypothyroidism and MDA and vitamin C to assess the oxidative stress and anti-oxidant status respectively in the individuals.

The mean value of T3 was found to be 1.05 ± 0.486 (ng / ml), T4 was found to be 9.21 ± 2.23 (µg / dl), TSH -2 ± 0.929 (µIU/ml), MDA -0.90 ± 0.25 (nmol /ml) VitC -1.029 ± 0.28 (mg/dl).

Table : 1

Values of t3, t4, tsh ,mda & vit c levels in control group

S.No	T3 (ng / ml) Mean±SD	T4 (µg / dl) Mean±SD	TSH (µIU/ml) Mean±SD	MDA Mean±SD	VitC (mg/dl) Mean±SD
1	1.051±0.486	9.21±2.23	2± 0.929	0.90±0.25	1.029±0.28

Values Of T3, T4, Tsh, Mda & Vit C Levels In Control Group

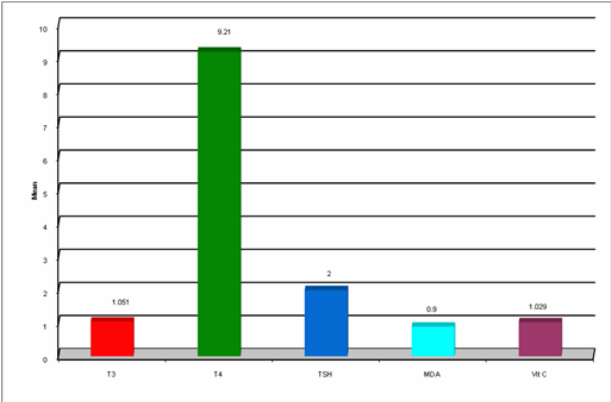


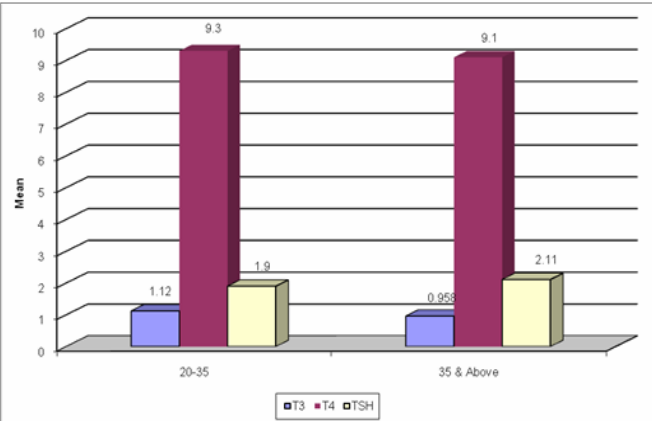
Table : 2

Values Of T3, T4, Tsh According To Age Group

S.No	Age Group	No of Individuals	T3 (ng / ml) Mean±SD	T4 (µg / dl) Mean±SD	TSH (µIU/ml) Mean±SD
1	20-35	15	1.12±0.48	9.3±2.41	1.90±0.94
2	35& Above	12	0.958±0.48	9.1±2.0	2.11±0.95

The T3 values were found to be higher in the age group 20-35 in the control group, whereas the TSH values were found to be higher in the 35& above age group.

Values of T3, T4 And Tsh According To Age Group



The statistical analysis shows no significance(NS) of T3,T4&TSH values in different age group.

Table : 4

Values of MDA & VIT C levels according to different age group

S. No	Age Group	No of Individuals	MDA LEVELS (nmoles/gm of Hb) Mean±SD	Vit C LEVELS(mg/dl) Mean±SD
1	20-35	15	0.90 ± 0.25	1.1 ± 0.079
2.	35 & Above	12	0.96 ± 0.25	0.941± 0.370

The MDA & Vit C levels in 20-35 age group was found to be 0.90 ± 0.25 nmoles/gm of Hb & 1.1 ± 0.079 mg/dl respectively. The MDA & Vit C levels in the age group 35 & above was found to be 0.96 ± 0.25 nmoles/gm of Hb & 0.941 ± 0.370 mg/dl respectively.

Values of Mda & Vit C Levels According To Different Age Groups

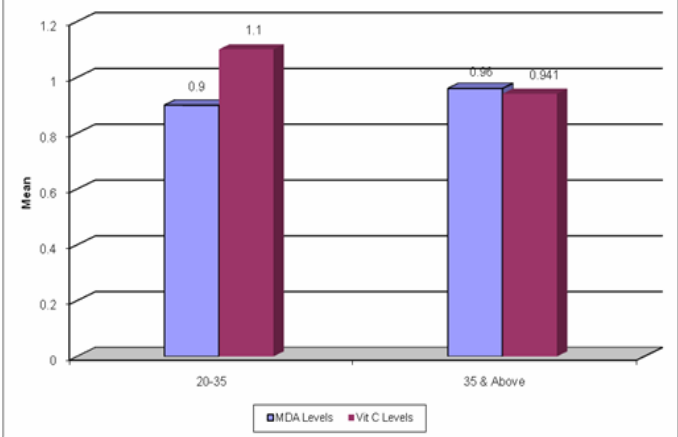


Table : 5

Statistical Analysis of MDA Levels & VIT C Levels According To Different Age Group

S. No	PARAMETER	T Test	P Value	Significance
1.	MDA LEVEL	1	P> 0.05	NS
2.	Vit C LEVEL	0.3	P> 0.05	NS

The statistical analysis of MDA Levels & Vit C Levels in different age groups were found to be insignificant (NS)

In the Morbid Group mean T3 was found to be 0.992 ± 0.472 ng/ml, $T4 5.362 \pm 2.68$ µg/dl & $TSH 19.748 \pm 20.77$ µIU/ml.

Values of T3, T4 And TSH In The Morbid Group

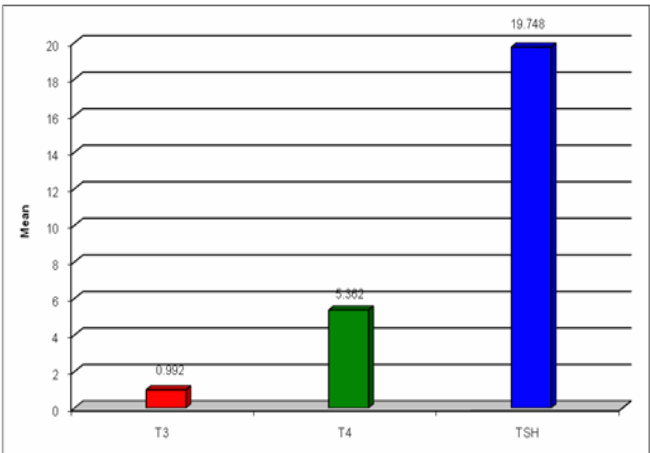


Table : 8

Statistical Analysis of T3, T4, Tsh According To Age Group

GROUP	PARAMETER	T Test	P Value	Significance
Hypothyroid & Control	T3	1.25	p> 0.05	NS
	T4	5.7	p< 0.001	S
	TSH	4.8	p< 0.001	S

Statistical Analysis of T3, T4, TSH according to age group Hypothyroid vs Control T3 was found to be insignificant(NS) whereas T4 & TSH was found to be Significant (S)

Values Of T3, T4 & Tsh In Varying Age Groups In The Morbid Group

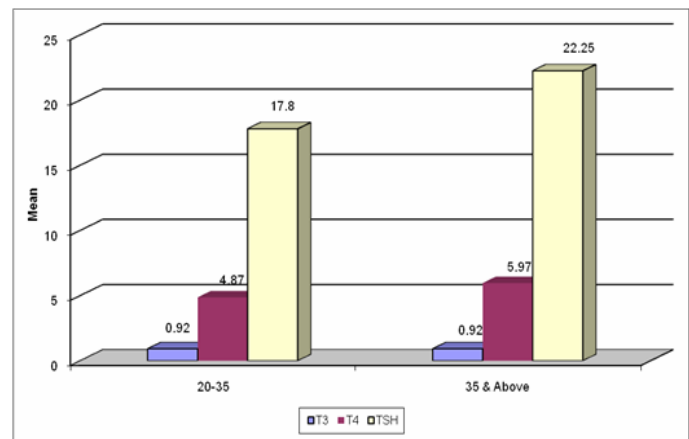


Table: 9

Statistical analysis of T3, T4, TSH according to age group

S. No	PARAMETER	T Test	P Value	Significance
1	T3	3.5	p< 0.001	S
2.	T4	1.5	p> 0.05	NS
3.	TSH	0.8	p> 0.05	NS

In the statistical Analysis of T3, T4, TSH according to age group T3 was found to be significant (S) ,T4 & TSH found to be insignificant(NS)

Table : 10

Value of MDA levels in the morbid group

S. No	MDALEVELS (nmoles/gm of Hb) Mean±SD
1.	1.73 ± 0.25

The mean value of MDA Levels in the Morbid group was found to be 1.73 ± 0.25 (nmoles/gm of Hb)

Value Of MDA Levels In The Morbid Group

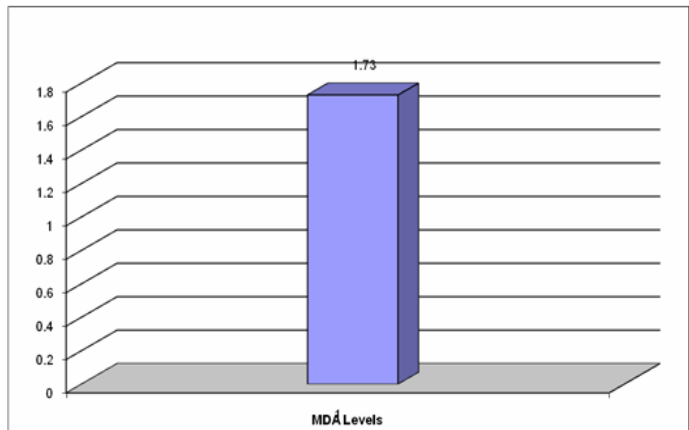


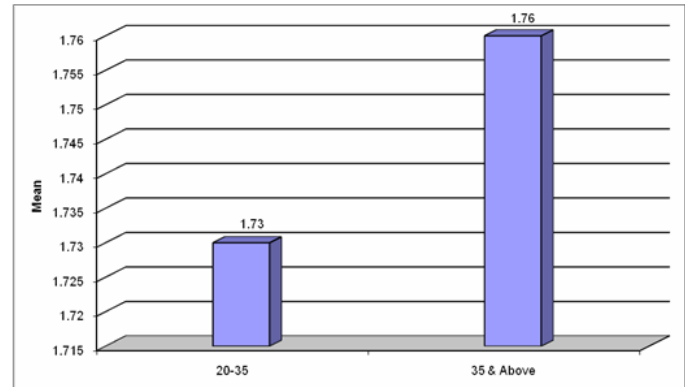
Table: 11

Values of MDA levels according to different age group

S. No	Age Group	No of Individuals	MDA LEVELS (nmoles/gm of Hb) Mean±SD
1	20-35	15	1.73 ± 0.25
2.	35 & Above	12	1.76 ± 0.25

The mean values of MDA Levels according to different age group 20-35 & 35 & Above was found to be 1.73 ± 0.25(nmoles/gm of Hb & 1.76 ± 0.25nmoles/gm of Hb

Values of MDA Levels According To Different Age Groups



Statistical Analysis of MDA Levels according to different age group 20-35 & 35 & Above both (p< 0.001) was found to be highly significant(S)

The value of Vit C Levels in the Morbid Group was found to be 0.322 ± 0.168 mg/dl

Value of VIT C Levels In The Morbid Group

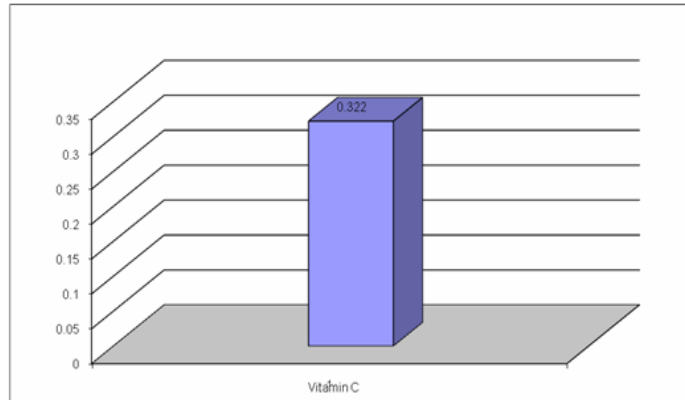


Table 14

Value of VIT C levels according to different age group

S. No	Age Group	No of Individuals	Vit C LEVELS(mg/dl) Mean±SD
1	20-35	15	0.36 ± 0.16
2.	35 & Above	12	0.27 ± 0.17

The mean value of Vit C Levels according to different age group 20-35, 35 & Above was found to be 0.36 ± 0.16 mg/dl, 0.27 ± 0.17 mg/dl respectively.

Value of Vitamin C Levels According To Different Age Groups

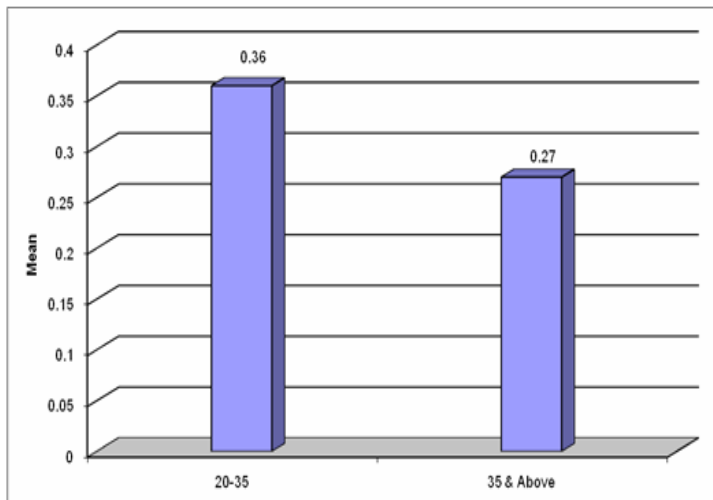


Table: 3
Statistical analysis of T3, T4, TSH according to age group

S.No	PARAMETER	T Test	P Value	Significance
1	T3	1.3	p> 0.05	NS
2.	T4	0.3	p> 0.05	NS
3.	TSH	0.84	p> 0.05	NS

Table : 6
Values of T3, T4, TSH in the morbid group

S. No	T3(ng/ml) Mean±SD	T4µg/dl (µg/dl) Mean±SD	TSH(µIU/ml) Mean±SD
1.	0.992 ± 0.472	5.362 ± 2.68	19.748 ± 20.77

Table: 7
Value of T3, T4 TSH in varying age groups in the morbid group

S. No	Age Group	No of Individuals	T3(ng/ml) Mean±SD	T4(µg/dl) Mean±SD	TSH(µIU/ml) Mean±SD
1	. 20-35	15	0.92 ± 0.37	4.87 ±2.72	17.8±20.8
2.	35 & Above	12	0.92±0.67	5.97±2.73	22.25±0.2

Table: 12
Statistical analysis of MDA levels according to different age group

S. No	Age Group	No of Individuals	T Test	P Value	Significance
1	20-35	15	13.8	p< 0.001	S
2.	35 & Above	12	12.8	p< 0.001	S

Table: 13
Value of VIT C levels in the morbid group

S. No	Vit C LEVELS(mg/dl) Mean±SD
1	0.322 ± 0.168

Table: 15
Statistical analysis of VIT C in the morbid group in different age group

S. No	Age Group	No of Individuals	T Test	P Value	Significance
1	20-35	15	41.5	p< 0.001	S
2.	35 & Above	12	8.2	p< 0.001	S

Table : 16
MDA & VIT C levels with correlation

PARAMETER	R value	SIGNIFICANCE
MDA LEVELS nmoles/gm of Hb v/s Vit C LEVELS (mg/dl)	-0.06	S

Statistical Analysis of Vit C in the Morbid Group in different age group (20-35 & 35 & above) was found to be highly significant (S) ($p < 0.001$)

Conclusion

The present work entitled "Analysis of anti oxidant status in varying age groups of hypothyroid patients in Bangalore" was done on 27 patients of hypothyroidism and age matched individuals of control group. All the individuals included in the study were females. The venous blood was collected and the hemolysate and serum thus obtained was utilized for analysis of MDA, Vitamin C, T3, T4 and TS4.

The patients with clinical symptoms of hypothyroidism were analyzed for T3, T4 and TS4 values. Serum T3 was found to range from 0.3 to 2.0 ng / ml with a mean value of 1.05 ± 0.48 ng / ml. Mean serum T4 was found to be 9.21 ± 2.23 ug/dl. With a range of 5.5 to 12.5 ug/dl, while mean TS4 was 2.0 ± 0.93 gIU/ml with a range of 0.7 to 4.0 gIU / ml. T3 and TS4 values were found to be higher in the age group of 20-35 compared to 35 and above. While T4 values were found to be higher in 35 and above group. Compared to 20-35 years age group.

Malonaldehyde (MDA) was found to be 0.90 ± 0.25 mol/gm Hb. The values were found to vary in different age groups but the difference was insignificant. Antioxidant vitamin C was found to be 1.029 ± 0.28 mg/dl. No significant difference in values was found in different age groups. All the values obtained were found to be same as reported by other works.

In the 27 women with clinical symptoms of hypothyroidism, TSH was significantly elevated ($P < 0.001$) and TSH was significantly low ($P < 0.001$) compared to the control group. But T3 value was found to be normal.

Hypothyroidism has been reported to be associated with oxidative stress. In the present study marker of oxidative stress MDA was found to be significantly increased ($P < 0.001$) compared to the control group. MDA was found to be increased in all age group which indicates that oxidative stress to be associated with hypothyroidism.

The antioxidant status in hypothyroidism was assessed by determining the concentration of vitamin c in serum. It was found to be significantly decreased indicating that due to oxidative stress caused by hypothyroidism antioxidant status is depressed.

The correlation of oxidative stress and antioxidant status was found to be significant which indicates that with increased generation of free radicals the antioxidant status is depressed. Hence hypothyroidism is associated with oxidative stress and antioxidant status gets depressed due to the oxidative stress.

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