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# Assessment of Correlation between Periodontal Disease Severity and Hashimoto's Thyroiditis in Female Patients- A Clinical and Radiographic, Cross-Sectional Study

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***Abstract:***
***Background****; Diverse number of factors and determinants influence the progression and manifestation of periodontal diseases. However the possible link between periodontal diseases and autoimmune diseases described in literature is due to the common immune-inflammatory pathway have been well described in literature.*
*The potential link between Hashimoto's Thyroiditis (HT) and Periodontal diseases are confirmed by Alveolar bone loss, Change in micro capillarity of Gingiva and Delayed wound healing is observed, suggesting the effect of Hashimoto's Thyroiditis on the periodontal tissues. Therefore the aim of present study was to assess the severity of periodontal diseases in Hashimoto's Thyroiditis in female patients.*
***Materials and Methods:*** *100 female patients with age range of 25-55 years suffering from Hashimoto's Thyroiditis confirmed were randomly selected for the periodontal and radiographic examination. Clinical parameters for periodontal examination included PI, SBI, PSR index and Radiographs which evaluated and correlated with values of T3, T4 and TSH.*
***Results****: The mean PI showed weak positive correlation with T3, T4 and TSH, mean SBI showed weak positive correlation with T3 and TSH, and radiographs showed weak positive correlation with T4.*
***Conclusion:*** *From the result obtained it can be concluded that prevalence of periodontal disease is associated with Hashimoto's Thyroiditis. Out of 100 patients, 60 were presented with PSR code of 2 and 3 indicating the cases of Mild to Moderate Gingivitis and stage A Periodontitis respectively. However the severity of periodontal diseases is mild in correlation to mean value of TSH 13.78mU/L.*
***Key Word****: Hashimoto's Thyroiditis; Hypothyroidism; Periodontitis; Periodontal diseases*

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## I. Introduction

Periodontitis is the multifactorial disease with microbial biofilm acts as initiator [1].Diverse number of factors and determinants influence the progression and manifestation of periodontal diseases.[1] The possible link between periodontal diseases and autoimmune disease are due to the common immune inflammatory pathway have been well described in literature.[2] The inflammatory pathway involves the release of inflammatory cytokines interleukin-6 (IL-6) and Tumor necrosis factor –alpha (TNF-α) produced in different autoimmune diseases spread in whole body as well as periodontal tissues.[3]

These cytokines along with the endotoxins released from plaque bacteria, stimulate the periodontal cells to produce matrix metalloproteinase (MMP) and other proteinases having destructive effects on periodontal tissues.[3]

Dr. Hakaru Hashimoto described Hashimoto's Thyroiditis in 1912,[4] which as an autoimmune thyroid disorder characterized by increase in thyroid stimulating hormone (TSH) and specific auto-antibodies like anti-TPO antibodies and anti-thyroglobulin antibodies.[4,5]

The systemic manifestation of Hashimoto's Thyroiditis include lower metabolic rate, weight gain, menstrual disorder, intolerance to cold, dry and cool skin, puffiness of face ,eyelid, dysgeusia etc. [6,7]

Apart from systemic manifestation the potential link between Hashimoto's Thyroiditis and periodontal diseases confirmed by alveolar bone loss (Molloy et al. 2004)[8] , change in micro capillarity of Gingiva ( Scardina and Messina 2018)[9] delayed wound healing (Kothiwale and Panjwani2017)[7] have been studied, ,suggesting that the effect of Hashimoto's Thyroiditis on the periodontal tissues.
Hence, this study attempts to assess the correlation of Hashimoto's Thyroiditis and severity of periodontal disease.

## II. Material And Methods

A Clinical Radiographic, Cross-sectional study conducted to assess the periodontal disease severity in 100 female patients diagnosed with Hashimoto's Thyroiditis. The study was conducted at private endocrinology center. Patients suffering from Hashimoto's Thyroiditis were selected randomly based on the sample size provided by biostatistician. The study protocol was approved by the institutional review committee (08/21) for human.

The patients were informed about the study. Written and verbal informed consents were obtained from all subjects prior to their enrolment in the study.

**Sample size calculation:** Sample size estimation was done by using **GPower software (version 3.0).** Sample size was estimated for Pearson correlation coefficient.

A minimum total sample size of 28 was found to be sufficient for an alpha of 0.05, power of 80 %.

**Exact -** Correlation: Bivariate normal model

| | | | |
|---|---|---|---|
| **Options:** | exact distribution | | |
| **Analysis:** | A priori: Compute required sample size | | |
| **Input:** | Tail(s) | = | One |
| | Correlation ρ H1 | = | 0.4472136 |
| | α err prob | = | 0.05 |
| | Power (1-β err prob) | = | 0.80 |
| | Correlation ρ H0 | = | 0 |
| **Output:** | Lower critical r | = | 0.3114899 |
| | Upper critical r | = | 0.3114899 |
| | Total sample size | = | 28 |
| | Actual power | = | 0.8054727 |

**Inclusion criteria:**

1. Female patients diagnosed with Hashimoto's Thyroiditis, age range of 25-55 years
2. Presence of all molars which didn't receive any surgical/non-surgical periodontal therapy.
3. Patients who are under medication for thyroid hormone replacement.

**Exclusion criteria:**

1. Pregnant and lactating women.
2. Patients who have undergone surgical or non-surgical periodontal therapy in last 6months
3. Acute lesions.

**Procedure methodology**

Screening of 100 female patients diagnosed with Hashimoto's Thyroiditis confirmed by concerned pathologist were randomly selected for periodontal and radiographic examination. Periodontal status was assessed using Plaque index (PI)[10] Sulcus bleeding index (SBI)[11] and Periodontal screening and recording index(PSR)[12]

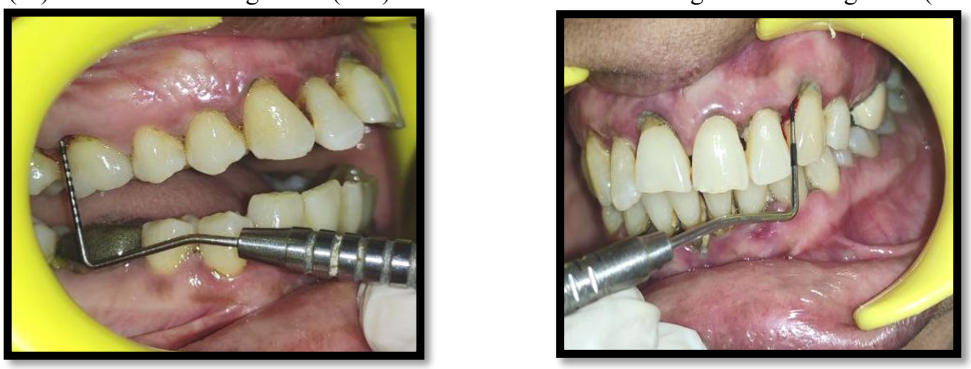


**Figure 1: Examination and screening of periodontal status in Hashimoto's Thyroiditis patient**

The teeth with highest PSR score were selected for radiographs. The digital image acquired was evaluated by using CS imaging software. Bone loss was measured in millimeters using digital scale available in software by keeping fixed point as CEJ to the most coronal point of contact of bone to tooth. The site with highest amount of bone loss was considered and analyzed.

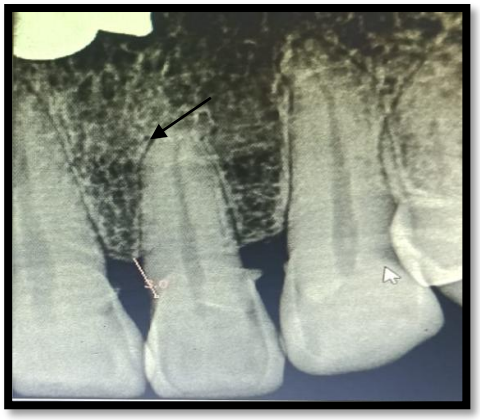


**Figure 2: Measurement of bone loss using scale on digital radiograph**

***Statistical analysis***

Data was entered into Microsoft Excel spreadsheet and was checked for any discrepancies. The data was analysed by SPSS (21.0 version). Shapiro Wilk test and Karl Pearson test were used to check normal distribution and Correlation between the variables respectively. Data was normally distributed. Level of statistical significance was set at p-value less than 0.05. Summarized data was presented using Tables and Graphs.

## III. Result

Table 1 and Figure 3: Mean age was found to be 37.47±9.7 years. Mean plaque index score was found to be 1.2±0.27. Mean PSR code was found to be 1.7±0.69. Mean SBI was found to be 0.52±0.34. Mean T3, T4 and TSH was found to be 2.0±0.87, 112.33±38.66 and 13.7±26.51 respectively.

**Table 1: Description of study variables**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| **AGE** | 100 | 21 | 56 | 37.47 | 9.794 |
| **PLAQUE INDEX** | 100 | 0.91 | 3.00 | 1.2690 | 0.27127 |
| **PSRCODE** | 100 | 1 | 4 | 1.74 | 0.691 |
| **SBI** | 100 | 0.120 | 2.010 | 0.52489 | 0.348942 |
| **T3** | 100 | 0.018 | 4.800 | 2.04958 | 0.877745 |
| **TSH** | 100 | 0.010 | 120.000 | 13.78847 | 26.516485 |
| **T4** | 100 | 1 | 179 | 112.33 | 38.667 |
| **RADIOGRAPH** | 100 | 1.1 | 4.5 | 2.896 | 0.8150 |

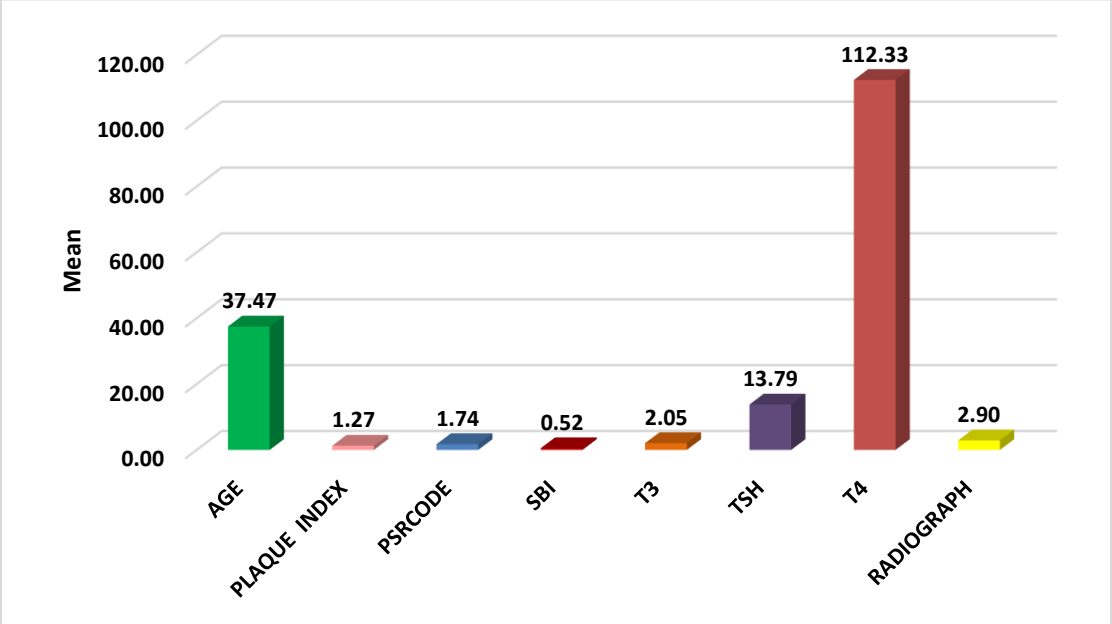
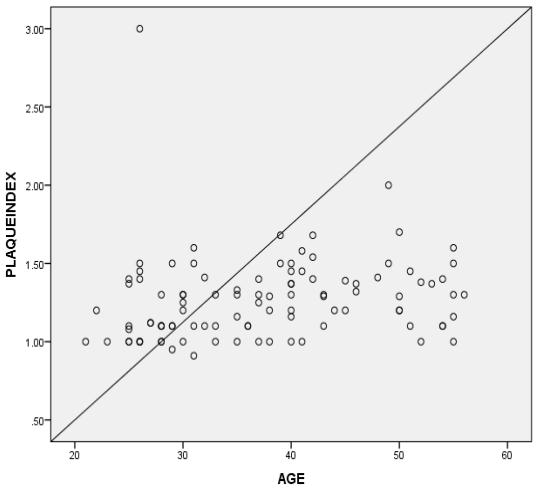



***Figure 3: Description of study variables***

Table 2 and Figure 4a, 4b, 4c, and 4d shows Correlation of plaque index score with Age, T3, T4 and TSH. Positive but weak correlation was seen among plaque index score with Age, T3, T4 and TSH with non significant p value as p>0.05.

**Table 2: Correlation of plaque index score with Age, T3, T4 and TSH**

| | | AGE | T3 | T4 | TSH |
|---|---|---|---|---|---|
| **PLAQUE INDEX** | **r** | 0.174 | 0.180 | 0.179 | 0.022 |
| | **P value** | 0.084, (NS) | 0.073, (NS) | 0.076, (NS) | 0.827, (NS) |
| | **N** | 100 | 100 | 100 | 100 |



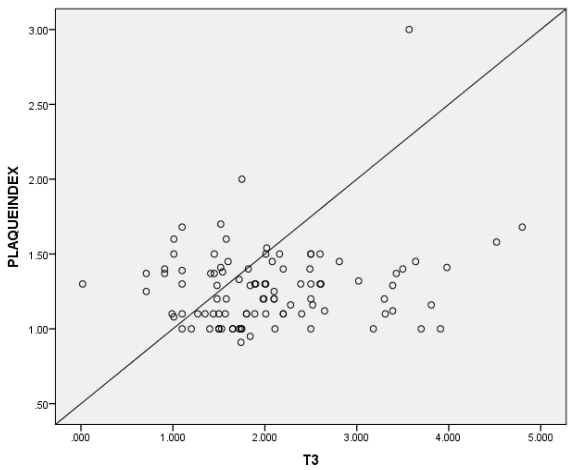
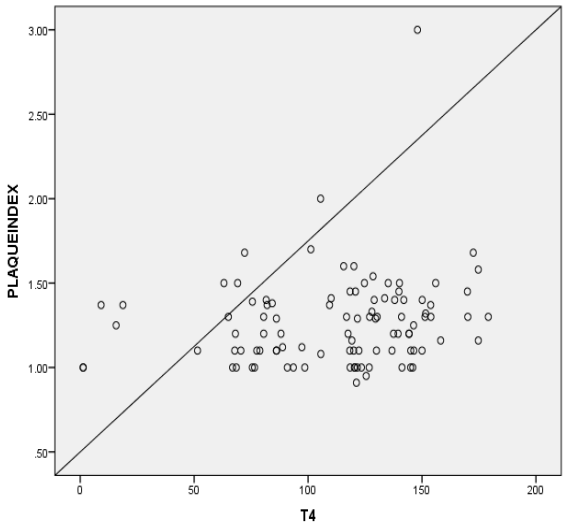




**Figure 4a: Correlation of plaque index score with Age Figure 4b: Correlation of plaque index score with T3**



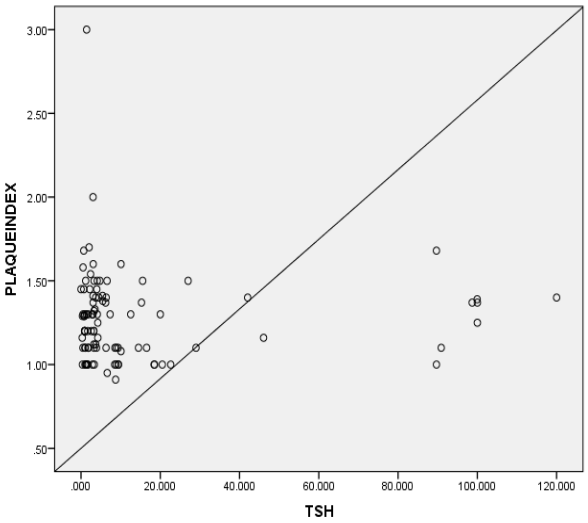
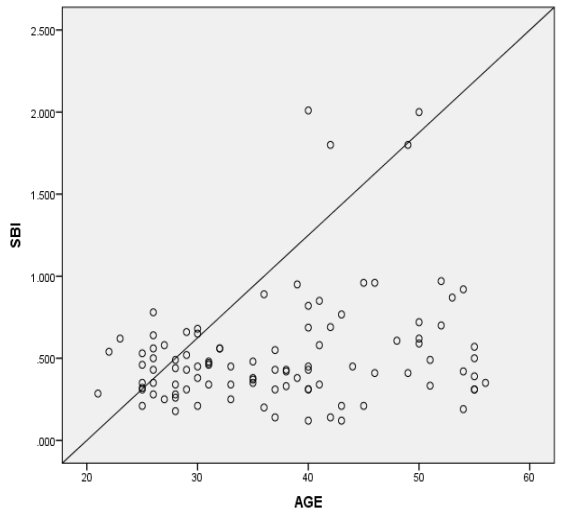




**Figure 4c: Correlation of plaque index score with T4** **Figure 4d: Correlation of plaque index score with TSH**

Table 3 and Figure 5a, 5b, 5c, and 5d shows Correlation of SBI score with Age, T3, T4 and TSH.
Positive Weak correlation was seen among SBI score and Age with significant p value as $p<0.05$. Positive but Weak correlation was seen among SBI with T3 and TSH and non significant p value as $p>0.05$. Moderate but negative correlation was observed between SBI and T4 with non significant p value as $p>0.05$.

**Table 3: Correlation of SBI with Age, T3, TSH, and Radiograph**

| | | AGE | T3 | T4 | TSH |
|---|---|---|---|---|---|
| **SBI** | **r** | 0.242* | 0.012 | -0.072 | 0.046 |
| | **P value** | 0.015* | 0.903 ,(NS) | 0.478, (NS) | 0.647, (NS) |
| | **N** | 100 | 100 | 100 | 100 |



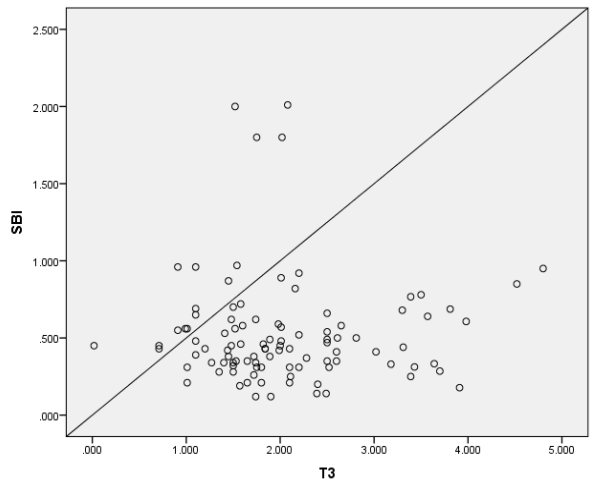




**Figure 5a: Correlation of SBI with Age** **Figure 5b: Correlation of SBI with T3**

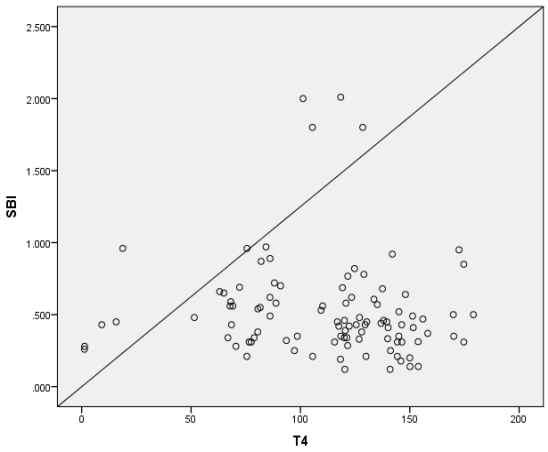



**Figure 5c: Correlation of SBI with T4**

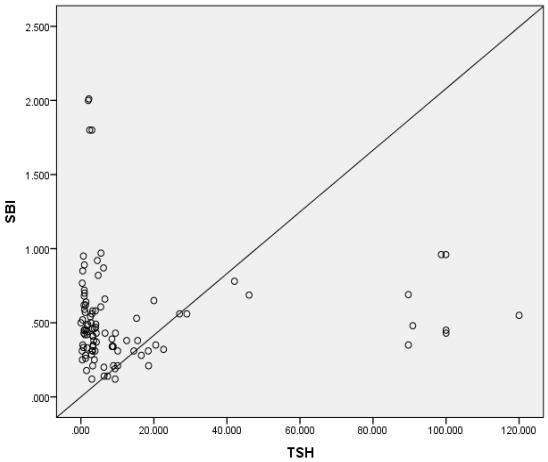



**Figure 5d: Correlation of SBI with TSH**

Table 4 and Figure 6a, 6b, 6c, and 6d show Correlation of PSR code with Age, T3, T4, and TSH.
Negative but weak correlation was seen among PSR code and T3, T4 and TSH with p>0.05. Positive but weak correlation was seen between PSR code and age with non significant p value as p>0.05.

**Table 4: Correlation of PSR code with Age, T3, T4, TSH**

| | | Age | T3 | T4 | TSH |
|---|---|---|---|---|---|
| **PSR CODE** | **r** | 0.096 | -0.181 | -0.114 | -0.027 |
| | **P value** | 0.343 (NS) | 0.071 (NS) | 0.263 (NS) | 0.788 (NS) |
| | **N** | 100 | 100 | 100 | 100 |

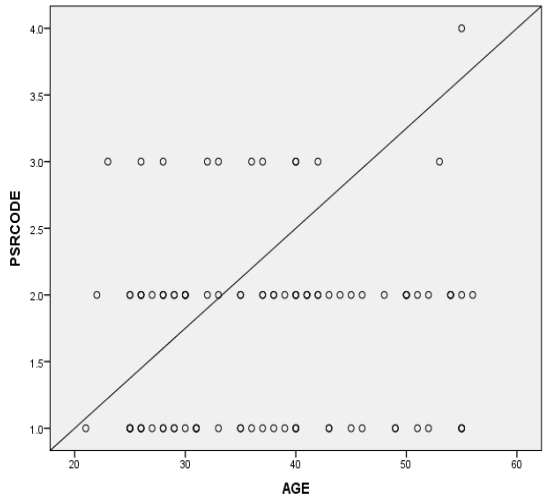



**Figure 6a: Correlation of PSR code with Age**

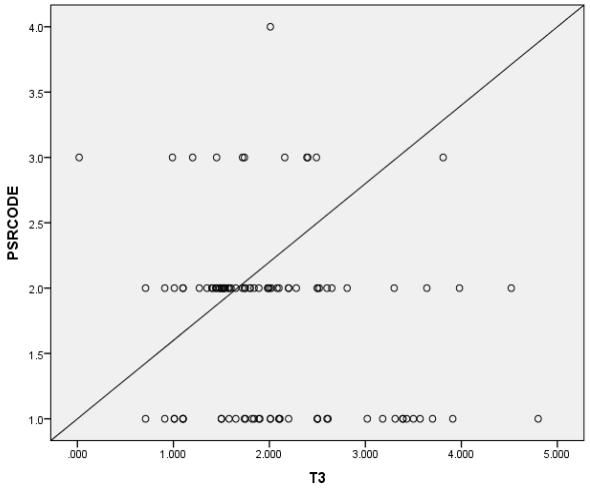



**Figure 6b: Correlation of PSR code with T3**

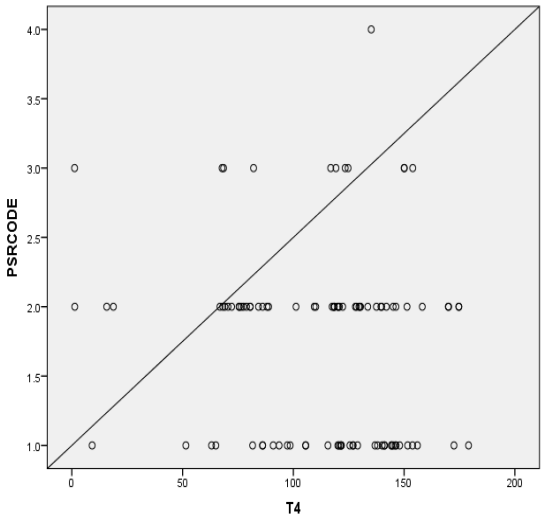



**Figure 6c: Correlation of PSR code with T4**

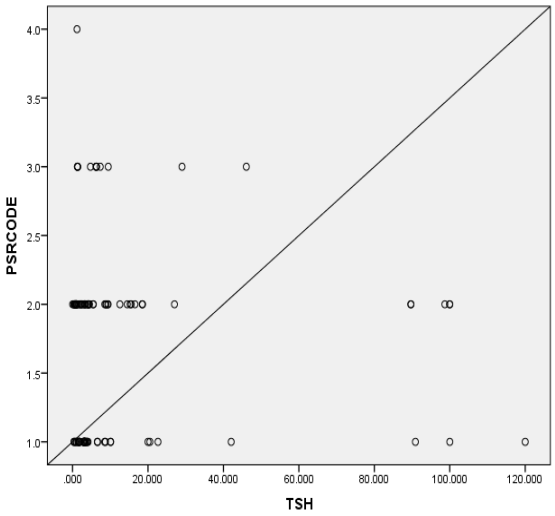



**Figure 6d: Correlation of PSR code with TSH**

Table 5 and Figure 7a, 7b, 7c, and 7d show Correlation of Radiograph with Age, T3, T4 and TSH.
Negative and weak correlation was seen among radiograph and T3, TSH values with non significant p value. Positive but weak correlation was seen between radiograph and age, T4.

**Table 5: Correlation among radiograph, age, T3, T4 and TSH**

| | | AGE | T3 | T4 | TSH |
|---|---|---|---|---|---|
| **RADIOGRAPH** | **r** | 0.180 | -0.001 | 0.069 | -0.054 |
| | **P value** | 0.073 (NS) | 0.990 (NS) | 0.495 (NS) | 0.591 (NS) |
| | **N** | 100 | 100 | 100 | 100 |

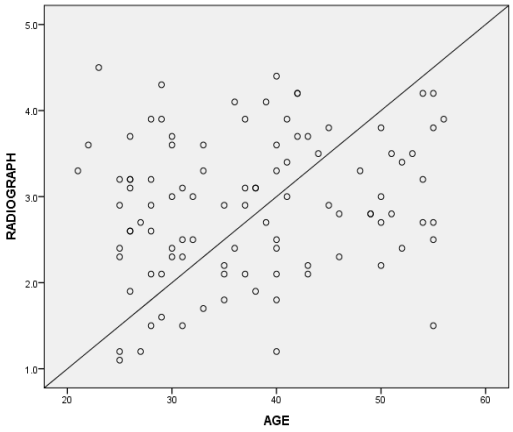



**Figure 7a: Correlation among radiograph and Age**

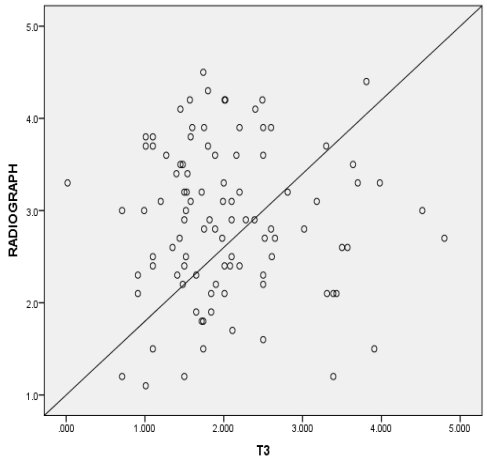



**Figure 7b: Correlation among radiograph and T3**

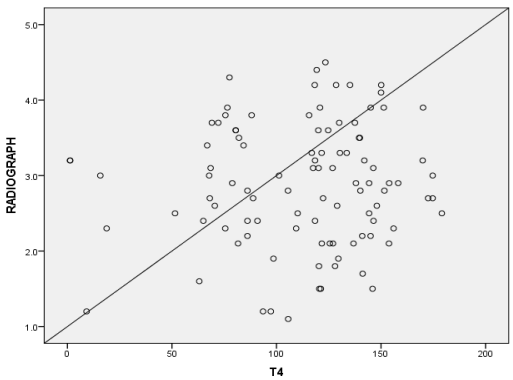



**Figure 7c: Correlation among radiograph and T4**

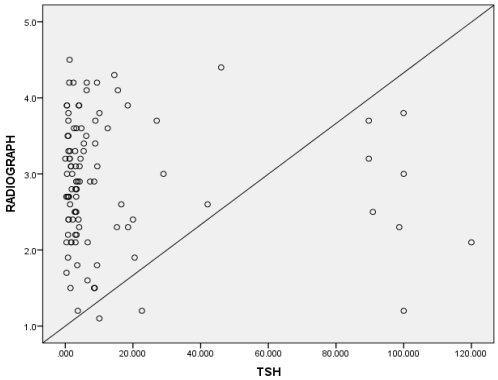



**Figure 7d: Correlation among radiograph and TSH**

## IV. Discussion

Female patients are super imposed by transient phases of hormonal variations. The advent of chronic autoimmune induced hypothyroidism (Hashimoto's Thyroiditis, HT) with its grave consequences affects female patients for periodontal therapeutic decision.

The common immune inflammatory pathways (MORAIS et al)[13], environmental factors and Genetic susceptibility (Patil et al.)[14] suggests the potential link between HT and Periodontitis.

Hence, our study emphasized to determine and investigate the T3, T4 & TSH levels in HT and correlate with the clinical and radiographic parameters.

The mean value of T3, T4 and TSH showed 2.04nmol/L, 112.33nmol/L, 13.78mU/L respectively, indicating that patients selected in this study were suffering from primary hypothyroidism with age range of 21-56 years [15]

In this study 60 patients presented with PSR code of 2 and 3 indicating Mild to Moderate Gingivitis and Stage A of Periodontal disease respectively. The PSR code of 3 with pocket depth of ≥4mm was in correlation with the mean value of TSH 13.78mU/L. **Zeigler, C.C., Wondimu, B., Marcus, C. et al. (2015)[16]** investigated that Adolescents with pathological periodontal pockets (PD ≥ 4 mm) showed significantly higher thyroid stimulating hormone (TSH) (P = 0.004) and BOP >25% (P = 0.002).

The weak positive correlation was acquired between plaque index score and T3, T4, TSH with r value of 0.180, 0.179 and 0.022 respectively. Statistically non significant result was seen with T3, T4 and TSH with p value of 0.073, 0.076 and 0.827. Analogous results were acquired in the study by **Patil et al.[14]**. A study by **Venkatesh Babu, N.S., Patel, P. B[17]** showed higher value of plaque scores in thyroid group compared to control group.

In our study Positive Weak correlation was seen among SBI and T3, TSH with r value of 0.012 and 0.046 and non significant p value of 0.903 and 0.647.Moderate negative correlation was observed between SBI and T4(-0.072) with non significant p value of 0.478. The result is in contradictory to study by **Zuhal YETKİN AY et al.[18]** where authors obtained positive correlation between GI and T4 value. The effect of Hashimoto Thyroiditis(HT) on microcirculation of gingiva studied by **Scardina, P. Messina[9]** where the author observed the increased in the number and tortuosity of capillary loops and reduced caliber of capillaries

Negative weak correlation between PSR code and T3, T4, TSH with r value of -0.181, -0.114 and -0.027 and with p value of 0.071, 0.263, 0.788 respectively. Contradictory result was seen in a study by **Patil et al.[14]** correlating the TSH and PSR code system. **Bhankhar et al.[19]** showed that there was significant reduction in the PBI score, CAL, PSR system and TSH in hypothyroid patients from baseline to 3 months follow up after non surgical periodontal therapy.

The Correlation of Radiograph with T3, T4 and TSH have showed the Negative weak correlation among radiograph and T3, TSH values(r:-0.001 and r:-0.054) with non significant p value (p=0.99 and p=0.591). Positive weak correlation was seen between radiograph and T4 (r=0.069) (p=0.591). Analogous results were acquired in study by **AR Talaeipour et al.[20].**

Additionally the positive correlation between the mean values of PI(1.26), SBI(0.52), PSR system(1.74) and Radiographs(2.896) with mean values of T3(2.04nmol/L) ,T4(112.33nmol/L) and TSH(13.78mU/L) are suggesting role of hormones that would influence the changes in periodontal structure which have demonstrated with clinical and radiographic findings.

## V. Conclusion

The present study assessed the severity of periodontal diseases in HT female patients. Based on the result obtained it can be concluded that prevalence of periodontal diseases is associated with Hashimoto's Thyroiditis. Further female patients presenting with Periodontitis should be considered for T3, T4 and TSH estimation.

These patients should refer to Endocrinologist and should keep on hormone replacement therapy. Once the level of hormone setback into normal range commencement of periodontal therapy is indicated.

Further clinical trials with high quality of studies on larger scale is required to provide the strong evidence of association between prevalence of periodontal diseases and HT.

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