



UNRAVELLING THE RELATIONSHIP BETWEEN SMOKING AND THYROID STIMULATING HORMONE: HOW TOBACCO USE ALTER THYROID

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Abstract

Background: In order to understand the possible changes in thyroid function regulation brought on by tobacco use, this study explores the complex link between smoking habits and TSH levels.

Methodology: This cross-sectional study included 160 individuals who were all chain smokers were included. And through purposive sampling technique they were divided into two groups: TSH Group 1, which included people with thyroid diseases that had been identified, and TSH Group 2, without such diagnoses. IRB approved the study and then blood samples were collected in Heparin gel tube and run in RMI laboratory (ISO certified), by using a Special Chemistry ELISA technique, samples were analyzed in less than eight hours to determine TSH levels.

Results: Significant differences in TSH levels were seen between the two groups. 80 participants in TSH Group 1, 15 had below 0.4 uIU/ml TSH values, whereas the remaining 65 had normal TSH. On the other hand, out of the 80 participants in TSH Group 2, 23 had below 0.4 uIU/ml TSH and 57 had normal TSH values. Interestingly, mean TSH levels were greater in those with prior thyroid disease diagnosis than in people without prior thyroid disorder diagnosis with significant P value less than 0.05.

Conclusion: Our study finds that those participants without having thyroid illness, smoking seems to make their thyroid dysfunction more serious, it's interesting to note that in chain smokers without thyroid disorders, the mean TSH levels increased with age, from the 18–30 to 51–60 age group.

Key Words: Thyroid stimulating hormone, thyroid disease, tobacco.

Introduction:

In humans, smoking is a widespread habit globally and has been proven to be unfavorable to various aspects of health (1). Tobacco consumption is one of the most widely used illicit substances in the world; by 2015, it is expected to kill 50% more people than HIV/AIDS and account for 10% of all deaths worldwide (2). Smoking can potentially harm the thyroid in people with low iodine levels, while in those with enough iodine, it may have immunogenic effects; the exact mechanism by which

it affects the thyroid gland is unknown (1). Tobacco in smoking has been linked to a higher incidence of thyroid autoimmune diseases, and over 80% of deaths are anticipated to happen in low- and middle-income nations, including India, Pakistan is quite alarming (3, 2).

The thyroid as a crucial part of the endocrine gland, it plays a vital role in the regulation and secretion of many hormones (4). Thyroid stimulating hormone (TSH), is a hormone produced by the pituitary gland, is controlled by the negative feedback from T3 and T4 (5). Thyroid-Stimulating Hormone (TSH) levels are significant because they serve as a sensitive indicator of thyroid disease like Graves 'disease, thyroid neoplasm, and thyroid adenomas that is subclinical (3, 6). They are crucial for determining the primary and secondary causes of thyroid illness as well as for detecting thyroid issues (7). TSH variations that coincide with T3 and T4 fluctuations suggest a secondary issue coming from the anterior pituitary. TSH changes that go against the direction of T3 and T4 on the other hand point to an issue with the thyroid gland itself (8).

A research conducted in 2017 found that the TSH levels of people who currently smoke was actually higher compared to those who don't smoke (9). Some studies showed that smoking had no noticeable impact on thyroid function (3). Another study in 2019 suggests a negative association between smoking and thyroid cancer (10). A similar study conducted and their study discovered that Thyroid-stimulating hormone (TSH) levels had a significant average increase over time in the whole population (11). In 2020 their study observed lower levels of TSH, higher levels of FT3 in individuals who smoked 20 cigarettes per day compared to those who never smoked (12). Chinese in 2018 investigated whether thyroid-stimulating hormone (TSH) plays a role in connecting smoking status with the risk of developing thyroid cancer (13). In 2014 some study despite the fact that the specific processes relating smoking to thyroid diseases are still being clarified (2).

Understanding the specific connection between smoking and TSH levels is a research need. As according to previous studies (9,3,10,11,12), they discussed about nonsmokers and smokers. Moreover, it is not clear that individual who is chain smoker and with no history of any thyroid illness would likely to be diagnosed with thyroid dysfunction, and Little is known about as age increases the risk of having abnormality in thyroid is increase.

Therefore, to fulfil the gap this study aimed to determine significant variations in thyroid stimulating hormone based on smoking status. We expected that there is a statistically significant difference if they have thyroid issue in their history or not but he/she is chain smokers so they are most likely to developed thyroid diseases among individuals aged 18 to 60.

Material and Method:

160 individuals were included in this cross-sectional research. The RMI Ethical Research Committee granted ethical approval in order to guarantee adherence to ethical principles and protect the rights and confidentiality of participants. All laboratory work was performed from April 2023 to September 2023 at Pathology department of Rehman Medical Institute, Peshawar Pakistan which is ISO certified Laboratory.

Through non probability purposive sampling technique participants with age 18 to 60 years old who are currently smoking from last 5 years and minimum 20 cigarette per day and have no co-morbidities were included in the study but their smoking status is confirmed by performing rapid test on Prime screen urine test kit and cotinine level greater than 400 ng/ml confirmed there status.

Self-administered questionnaires were utilized to gather data on thyroid-related issues, medical history, smoking history, and demographics. According to their respond they were divided into two groups: TSH Group 1, which included people with thyroid diseases that had been identified in their history, and TSH Group 2, which included people without such diagnoses.

Venous blood samples were collected by aseptic technique in Heparin gel tube and to ensure proper

labeling the samples with unique identifiers to maintain participant confidentiality were performed. We handle blood samples with care to prevent contamination or degradation. For each individual we perform TSH measurements by utilizing a Special Chemistry ELISA method to measure TSH levels, and to ensure that the TSH measurements are conducted within 8 hours of sample collection to maintain sample integrity.

We used SPSS version 29 for inferential statistics T independent test in which we compare the mean two different groups TSH parameters of already diagnosed thyroid and without thyroid.

Results:

In the 18-30 age group, 33 individuals who are already diagnosed with thyroid disease (Yes), while 56 individuals had no history of thyroid diagnosis (No).

Among participants aged 31-50, 41 individuals who are already diagnosed with thyroid disease (Yes), whereas only 12 individuals reported no history of thyroid diagnosis (No).

In the 51-60 age group, 6 individuals were already diagnosed with thyroid disease (Yes), while 12 individuals did not report a history of thyroid diagnosis (No). Age wise distribution is described in figure 1.

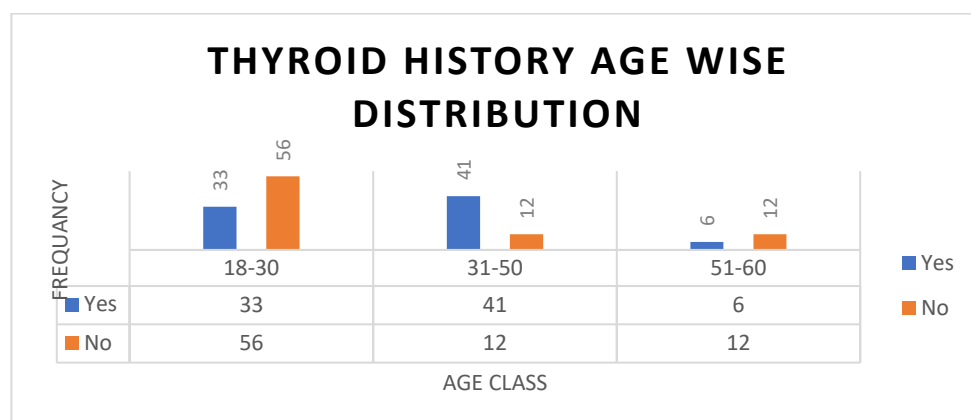


Figure 1 Thyroid history age wise distribution

In the 18-30 age group, 6 individuals exhibited "Abnormal" TSH 1 levels, and 18 people had "Abnormal" TSH 2 levels while 27 individuals had "Normal" TSH 1 levels, and 38 people had "Normal" TSH 2 values.

For participants aged 31-50, 9 individuals had "Abnormal" TSH 1 levels, three peoples had "Abnormal" TSH 2 levels whereas 32 individuals had "Normal" TSH 1 levels., while nine participants had "Normal" TSH 2 values.

In the 51-60 age group, none of the participants showed "Abnormal" TSH 1 levels, while two peoples in the 51-60 age range had "Abnormal" TSH 2 levels, whereas 6 individuals had "Normal" TSH 2 levels. and 10 peoples had "Normal" TSH 2 values.

Age wise TSH distribution is shown in table 1.1

Age wise TSH distribution Table 1.1				
Age Group	TSH Normal 1	TSH Abnormal 1	TSH Normal 2	TSH Abnormal 2
18-30	27 (33.75%)	6 (7.5%)	38 (47.5 %)	18 (22.5%)
31-50	32 (40%)	9 (11.25%)	9 (11.25%)	3 (3.75%)
51-60	6 (7.5%)	0 (0%)	10 (12.5%)	2 (2.5%)
Total	80 (100%)		80 (100%)	

The TSH levels of individuals in the 18-30 age group with already diagnosed history of thyroid issues

(TSH-I) were measured. The mean TSH level for this group was found to be 2.19.

In contrast, the TSH levels of chain smokers in the same age group without a diagnosis history of thyroid issues (TSH-II) were also assessed. The mean TSH level for this group was 1.27. Notably, the TSH-I group, with already diagnosed history of thyroid issues, exhibited a higher mean TSH level compared to the TSH-II group. Figure 2 presents the individual TSH measurements for the TSH-II and TSH-I group in the 18-30 age range.

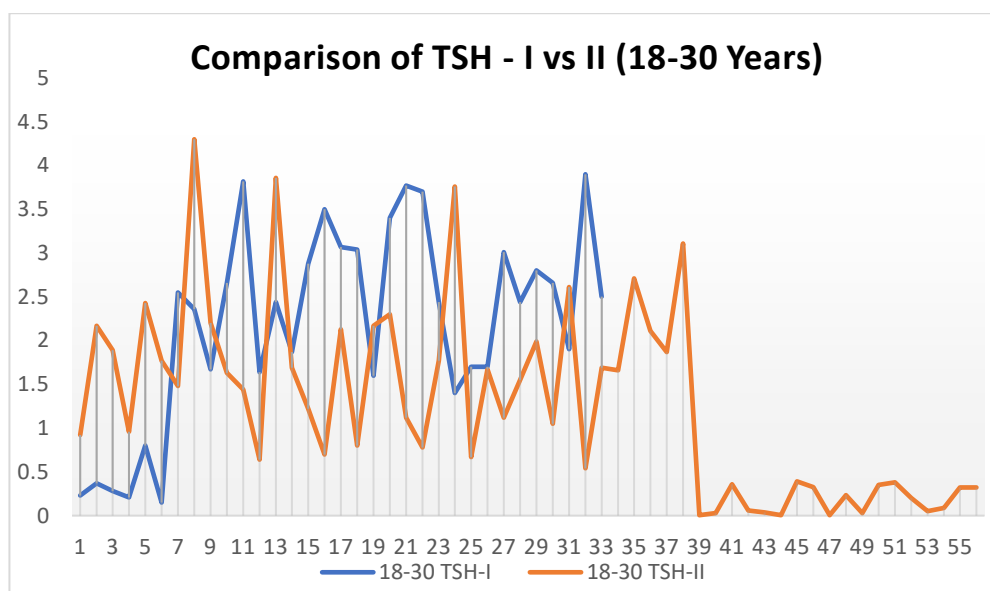


Figure 2 Comparison of TSH - I vs II (18-30 Years)

For chain smokers the mean TSH-I level was discovered to be 2.13 between the ages of 31 and 50 who had already diagnosed history of thyroid problems. In contrast, chain smokers in the same age group without a diagnosed history of thyroid issues (TSH-II) exhibited a lower mean TSH level, measuring 1.67. Figure 3 presents the individual TSH measurements for the TSH-II and TSH-I groups in the 31-50 age range.

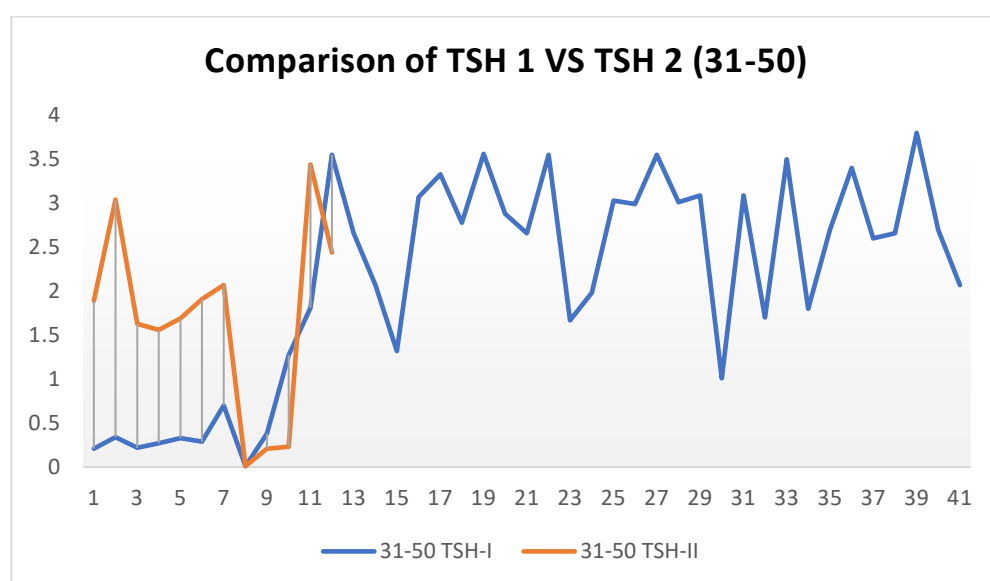


Figure 3 Comparison of TSH 1 VS TSH 2 (31-50)

For chain smokers aged 51-60 with a diagnosed history of thyroid issues (TSH-I), the mean TSH

level was found to be 2.3. In contrast, chain smokers in the same age group without a diagnosed history of thyroid issues (TSH-II) exhibited a lower mean TSH level, measuring 1.44. Figure 4 presents the individual TSH measurements for the TSH-I and TSH-II group in the 51-60 age range.

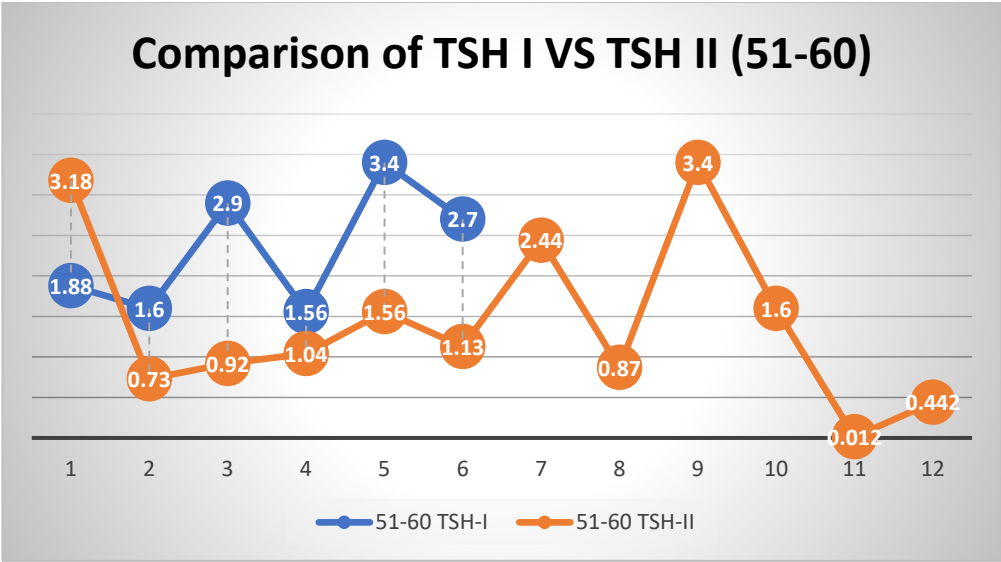


Figure 4 Comparison of TSH I VS TSH II (51-60)

The p-value for the t-test for equality of means (equal variances not assumed) is 0.000, which indicates that there is a significant difference between the means of the two groups. The 95% confidence interval for the difference between the means of the two groups is [-1.02, -0.30], which does not include zero. Therefore, based on both the p-value and the confidence interval, we reject the null hypothesis and conclude that there is a significant difference between the mean scores of Group 1 and Group 2 in the population.

Table 1 Independent Samples Test of TSH-I and TSH-II

Groups	M	SD	t	df	p	Lower 95%	Upper 95%
TSH-I	2.1764	1.12908	4.673	158	.000	.46698	1.15067
TSH-II	1.3675	1.05910					

Discussion:

Abnormalities in the thyroid system can have a broad range of consequences on an individual's health, as it is a vital component of entire body function. The findings of this study greatly advance our knowledge of the connection between smoking, thyroid disorders, and levels of thyroid-stimulating hormone (TSH) in various age groups.

According to our findings Individuals with a history of thyroid illness (TSH-I) in the 18–30 age group had a mean TSH level of 2.19 and 6 participants have below normal TSH value, which was much higher than the mean TSH level of 1.27 with 18 participants have below normal TSH values for those without thyroid disease (TSH-II) in the same age group (Figure 1.4). These findings support previous research conducted in 2019 that linked thyroid dysfunction to increased TSH levels (14). According to another study conducted in 2021, thyroid dysfunction may be more common in this age group because to changes in lifestyle and stresses (15). Which also support our findings that smoking habit and in young aged (18-30) where majority of peoples smoked due to stress and eventually that will lead to disturbed thyroid function.

These age group's results also provide a crucial starting point for understanding how thyroid illness affects TSH levels in later age groups.

A similar pattern shows up when we proceed to the age range of 31 to 50. The mean TSH level for the TSH-I group was 2.13, with 9 participants have below normal TSH values, whereas the mean TSH level for the TSH-II group was 1.67 where 3 peoples have abnormal TSH values (Figure 1.5). Remarkably, those with a history of thyroid illness still had greater TSH levels than people without thyroid illness, which provides support to the theory that thyroid dysfunction may, at least in part, be age-independent (15).

These findings further emphasize the need of thyroid function monitoring in this age group, as thyroid illness may become more common and significant as people age, the study's age-specific differences in TSH levels highlight the necessity of having an in-depth understanding of thyroid function at all stages of life (12).

An important component of this research is how smoking affects thyroid function (16). Smokers (TSH-I) with a history of thyroid illness consistently had higher mean TSH levels than non-smokers (TSH-II) within each age group. This is consistent with earlier studies' findings that smoking may affect thyroid parameters (10, 9).

For those who have a history of thyroid illness, smoking seems to exacerbate thyroid dysfunction. It is unclear and complicated what processes underlie this connection. But smoking has a known effect on autoimmune and thyroid hormone levels (7, 1). For example, cigarette smoke contains a variety of substances that may disrupt the metabolism and the synthesis of thyroid hormones (2).

Furthermore, alterations in thyroid antibody profiles have been connected to smoking (12, 17). These adjustments could be part of the reason why TSH levels in thyroid disease patients differ between smokers and non-smokers. According to study done in 2020, the immune system's reaction to exposure to cigarette smoke is complicated and may involve pathways connected to autoimmunity (12). Which is aligned with another study and they find that non-smoker group had lower increases in TSH levels compared to ex-smokers and non-smokers groups (17).

The results of this investigation have several therapeutic implications. First of all, while evaluating thyroid function in clinical practice, they emphasize the significance of considering smoking status and age into account. Physicians should be aware that smoking might aggravate thyroid dysfunction, which can affect people of all ages but specifically young aged due to severe stresses start smoking and disrupt their quality of life. To provide complete treatment for patients with thyroid diseases, regular thyroid function monitoring and knowledge of lifestyle factors, such as smoking, is important.

Conclusion:

According to our findings those participants without having thyroid illness, smoking seems to make their thyroid dysfunction more serious, however the exact causes are yet unknown.

It's interesting to note that in chain smokers without thyroid disorders, the mean TSH levels in the TSH-II groups increased with age, from the 18–30 age group to the 51–60 age group. People who haven't a history of thyroid illness regularly have higher TSH levels, demonstrating that thyroid dysfunction continues throughout life. These findings suggest that smoking and thyroid function may be related.

future studies require to focus on the precise pathways through which smoking influences autoimmune and thyroid function.

Conflict of interest:

There is no conflict of interest

There is no funding.

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