

## Original Article

# Effect of Tobacco smoke on Thyroid Hormone level in males – A prospective study in western Uttar Pradesh

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### Abstract:

**Background:** Cigarette smoking is a well-known risk factor for chronic respiratory illness leading to increase morbidity and mortality . Association between smokers and coronary heart diseases and many other malignancies have been well established. However its impact on thyroid gland and thyroid hormone level has been inconsistent. We aim to evaluate the serum thyroid hormone level in male smokers from rural are of Durg district and compare this with ex-smokers and persons who never smoked.

**Material and Method:** study comprised of 150 males who has attended our chest OPD or admitted in the chest & TB ward of Teerthankar Mahaveer Medical college & hospital Moradabad, UP. Fasting serum  $T_3$ ,  $T_4$  and TSH level were measured in smokers, non smoker and ex-smoker and their relationship observed.

**Results and conclusions:** Serum  $T_3$  and  $T_4$  levels were found to increased in smokers than in non smokers and ex smokers while serum TSH level were reduced in smokers as compared to ex smokers and individuals who never smoked.

**Keywords:** Thyroid , TSH, Smoking

### INTRODUCTION:

Apart from chronic respiratory illness smoking do effect other systems in our body either directly or indirectly. Earlier studies have documented association between smoking and Grave's disease and Grave's ophthalmopathy also termed as endocrine ophthalmopathy<sup>1</sup>. Ample evidences are reported to have effect of tobacco on human endocrine system. Tobacco has multiple effect on hypothalamic pituitary thyroid axis and functions of thyroid gland. Tobacco smoking modifies almost all the functions of thyroid gland<sup>2</sup>. Results from some studies have shown increased thyroid hormone levels in smokers then nonsmokers<sup>3,4</sup> while other studies have not shown this result<sup>5,6</sup>.

### METHODOLOGY:

It is a cross sectional observational study comprised of 150 males from the local community who have attended our chest clinic in OPD or admitted in the chest and Tuberculosis department of Teerthankar Mahaveer Medical college and hospital, Moradabad. After taking proper history they were divided into current smoker, ex- smoker and non smoker, depending on their smoking habits. Smokers are individuals who were smoking at the time of study. Ex-smoker or previous smokers are the those persons who were earlier smoker but has stopped smoking about more than one year back. While non smoker had not smoked earlier neither had taken any form of tobacco. Male individual between 20-60 yrs of age were included. Procedure and objective of the test were explained to the participants in detail and written consent taken. Also approval from the ethnic committee of the college obtained. Physical examination of all the subjects were done for presence of thyroid enlargement, tenderness or nodules . individual with history of

thyroid enlargement, history of taking antithyroid drugs, steroid intake or thyroid surgery were excluded. also persons having chronic illness like Diabetes, Hypertension having chronic liver and kidney were excluded from the study group. Following overnight fast, blood obtained from all individual and subjected for TT<sub>3</sub>, TT<sub>4</sub> and TSH level measurement. Result thus obtained were collected and analyzed.

**OBSERVATION:**

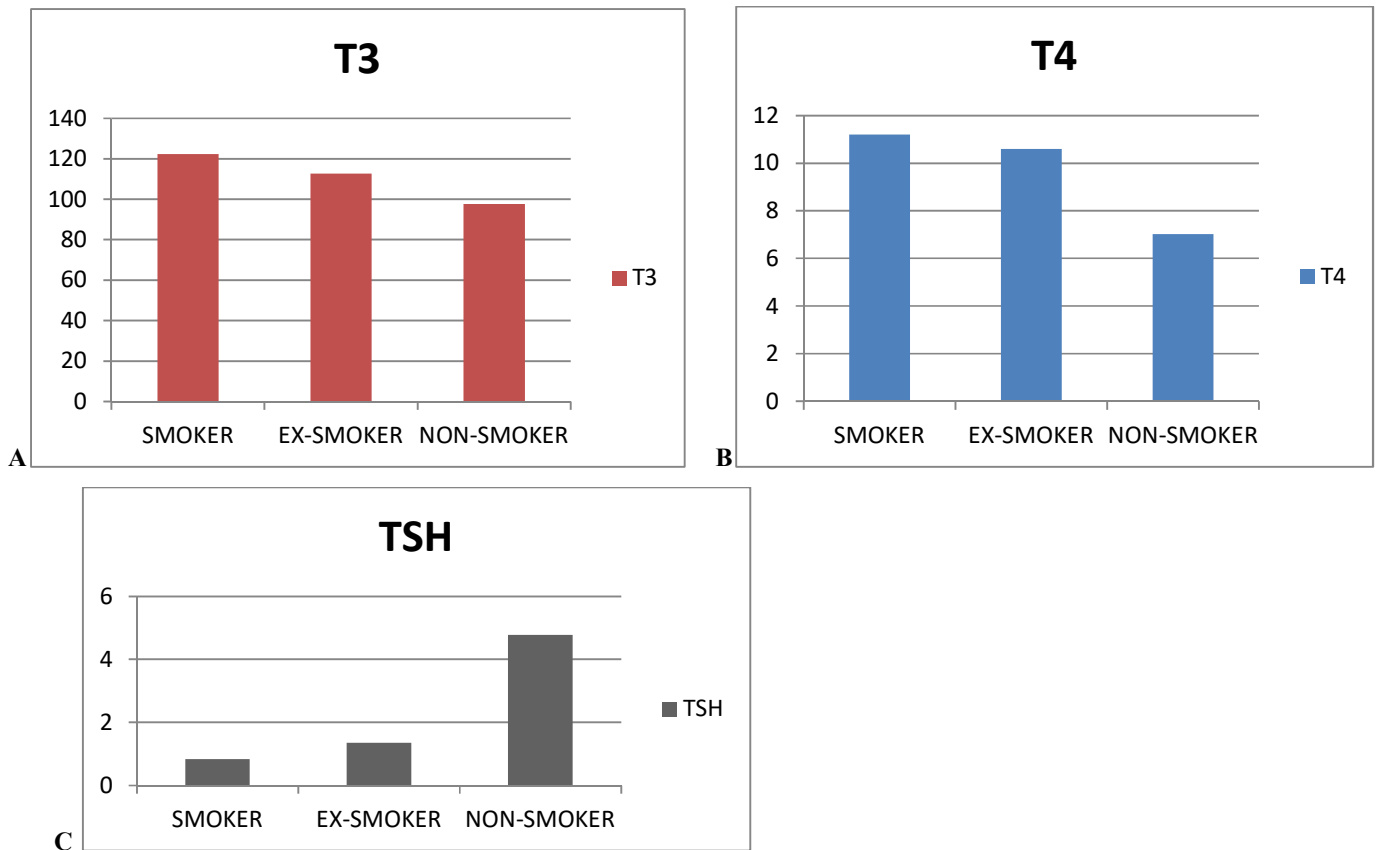
Mean total serum T<sub>3</sub> concentration level was higher among smokers than other two groups(122.3 vs. 112.7) and ( 122.7 vs. 97.6). Total serum T<sub>4</sub> between smokers and ex-smokers appears to be higher than non smokers.

On the other hand total serum TSH level in smokers and former smokers found to be low normal (1.35 vs0.84) as compared to smokers which happened to be on the higher side of normal.

TABLE-1 : MEAN HORMONE CONCENTRATION OF TOTAL TRIIDOTHYROIDIN , THYROXIN AND THYROID STIMULATING HORMONE IN SMOKERS , EX SMOKERS AND NON SMOKERS.

INVESTIGATION	SMOKER (n-50)	EX-SMOKER(n-50)	NON-S MOKER(n-50)
<b>T3</b>	122.3	112.7	97.6
<b>T4</b>	11.2	10.6	7.02
<b>TSH</b>	0.84	1.35	4.77

**GRAPH 1- A to C :** COMPARISON OF TRIIDOTHYRONIN, THYROXIN AND THYROID STIMULATING HORMONE LEVELS IN SMOKERS,EX-SMOKERS AND NON SMOKERS RESPECTIVELY.



## DISCUSSION:

Of more than 7000 compounds which constitutes the chemical nature of cigarette smoke around more than 150 are carcinogenic in nature and they do alter the physiological state of the individual<sup>7</sup>. The effect of cigarette smoke on thyroid hormone level, perhaps related to many toxins including Thiocyanate, 2,3 hydroxy pyridine, 3,4- benzopyrene and hydroxyquinones, present in tobacco smoke<sup>8,9</sup>. Thiocyanate is the major component of the smoke believed to be responsible for alteration in the thyroid function. It is a derivative of hydrogen cyanide with a half life of more than 6 days<sup>3,10</sup>. Thiocyanate appears to inhibit iodine uptake, transport and organification and thereby inhibiting thyroid hormone synthesis<sup>11</sup>. 2,3 hydroxypyridine inhibit T<sub>4</sub> deiodination by limiting iodothyronine deiodinase activity and hence temporarily elevate T<sub>4</sub> level<sup>12,13</sup> although, thyroxine deiodination may be accelerated by 2,3 benzopyrene another compound in tobacco smoke<sup>14</sup>. Hydroxyquinones, impairs degradation of T<sub>4</sub> resulting in elevating its serum concentration by increasing intracellular calcium level<sup>15</sup>. Smoking cigarette causes hypoxia and resulting free radical injury do effect thyroid gland function<sup>16,17</sup>. Smoking may promote inflammatory process by increasing IL-1 thus contribute to auto-immune thyroiditis<sup>18</sup>. Balfour as early as 1989 showed that nicotine was a potent activator of human platelet antigen (HPA). It mimics the effect of acetylcholine at selected central nicotinic acetylcholinergic receptors causing sympathetic activation thereby causes thyroid secretion. Thus, tobacco smoke have dual mode of action on thyroid gland, direct suppression by thiocyanate along with indirect activation through the HPA<sup>2</sup>. It thus appears that there are different mechanism and pathways through which tobacco smoke impart its action on thyroid gland directly or indirectly. Our study demonstrated that current smokers have higher serum TT<sub>3</sub> and TT<sub>4</sub> level than the persons who have never smoked. Mean serum TT<sub>3</sub> and TT<sub>4</sub> appears to be slightly higher in subjects who have stopped smoking more than one year back. However mean serum TSH value found out to be lower in smokers in comparison to ex-smokers or the persons who never smoked. Similar result have been observed by Chester Fisher et al<sup>19</sup> who has performed his work with Vietnam era male U.S. army veterans by measuring their T<sub>4</sub>, FTI and TSH level. Studies conducted by Melander A et al<sup>20</sup> however found increase TT<sub>4</sub>, rT<sub>3</sub> but normal T<sub>3</sub> levels. Whereas studies conducted by Karakaya A et al<sup>3</sup> and Lios et al<sup>21</sup> have reported only increased in T<sub>3</sub> level without any change in T<sub>4</sub> level. Jorde R et al<sup>22</sup> have concluded higher values for free T<sub>3</sub> (fT<sub>3</sub>) and free T<sub>4</sub> (fT<sub>4</sub>). Decrease level of both T<sub>3</sub> and T<sub>4</sub> was observed by Sepkovic DW<sup>6</sup> et al. Serum TSH level however found to lower in most of the studies done by Ericsson et al<sup>23</sup>, Joffe RT and Levitt AJ 1988<sup>24</sup> and others in smokers in comparison to ex-smoker and non smokers, as indicated in our study as well. Some studies conducted by Hegedus L. et al 1985 and Petersen et al 1991 concluded no difference in thyroid hormone level among smokers and non smokers<sup>2</sup>. One study conducted on Norwegian population, author reported prevalence of overt hyperthyroidism was higher in smokers as compared to non smokers<sup>25</sup>. Association of smoking with subclinical hypothyroidism have shown lower prevalence rate in one study conducted by Cho NH et al<sup>26</sup> in non iodine deficient normal Korean population.

## CONCLUSION:

It is thus clearly evident that functions of the thyroid gland do get effected by smoking habits although different studies have shown inconsistent results. Like many studies, our study do have several potential biases making us unable to generalized the result. Firstly, study group is small mostly consist of males from rural background who either smoke biddies or cigarette but other form of tobacco consumption like hookah, chewing tobacco were not included. Also, division of group into smokers, ex-smokers and non smokers were done on self reporting smoking status. Biomarkers for cigarette smoke exposure like serum cotinine level couldn't be measured. In spite of all these bias, alteration in serum thyroid hormone level in smokers without abnormal thyroid

gland in clinical examination may be related to direct effect of smoking on thyroid gland. Further studies however needed to confirm this conclusion.

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