



## Morphological Analysis Of Thyroid Gland In Cases Of Alleged Suicidal Deaths: A Prospective Analysis

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### Abstract

**Introduction:** The thyroid gland is a bi-lobed structure located in front of neck weighing about 40 grams. It starts functioning at about 10th week of fetal life and plays vital role in tissue metabolism and general growth and development. It secretes three hormones T3, T4 and Thyrocalcitonin.

**Aims & objective:** To study association of the changes in the weight and morphology of thyroid gland in suicidal and non suicidal cases.

**Material and methods:** In this prospective study, thyroid glands were collected from dead bodies brought for medico-legal autopsies to the department of Forensic Medicine and Toxicology from Dec. 2015 to Sep. 2017. After removal, the weight was recorded, and then the gland was preserved and fixation done in 10 % formalin for more than 2 weeks. After 2 weeks, grossing was done and slides were prepared and studied.

**Results:** In study group cases, maximum weight of thyroid gland was 27.6 grams and minimum was 18.5 grams. In control group cases, maximum weight was 26.5 grams and minimum was 18.7 grams. The mean weight of the thyroid gland in the suicidal group was 22.21 grams and the standard deviation was 2.21 grams whereas the mean weight of the thyroid gland in the non-suicidal group was 22.00 grams and the standard deviation was 1.98 grams. Of 50 study cases, 15 (30%) revealed significant pathological findings and the rest 35 (70%) were histologically normal (Fig.6). 14 of these cases (28%) revealed focal lymphocytic thyroiditis (FLT) and only 1 case (2%) showed nodular goitre (NG). Of the 50 control cases, 17 (34%) revealed significant pathological findings and the rest 33 (66%) were histologically normal (Fig.7). 16 (32%) of these revealed focal lymphocytic thyroiditis and only 1 case (2%) showed multi nodular goitre (MNG) .

**Keywords:** Thyroid gland, suicide, weight, depression, lymphocytic thyroiditis

### Introduction

Every suicide is a personal loss that takes the untimely life of an individual. The families and friends of the person are mostly affected. More than one lakh persons in our country lost their lives by committing suicide and it was showing increase of 3 % to 4 % every year.<sup>1</sup> There are many different models which elucidate the occurrence of suicidal behaviour. The two models which are accepted

included (1) the stress–diathesis model and (2) the process model. The stress–diathesis model explains why one person committed suicide and the other person did not, while they are in a depressive episode. The risk of suicide does not completely depend on the severity of the psychiatric disorder but also depends on other variations or predispositions. Certain states associated with suicidal behaviour include adverse life episodes, such as interpersonal or

social problems and the acute intrinsic psychiatric illness. Currently recognised causes of the diathesis include demographic factors like sex, religion and genetic influences, childhood experiences, psychosocial support system, rearing and early traumatic life experiences, chronic illness, chronic substance or alcohol abuse, etc. The process model include the interaction of state-trait and with time this interaction slowly develops into suicidality. This model also describes the development and progression of suicidality within individual with surrounding interactions.<sup>2</sup>

The thyroid (Photo 1) is a butterfly-shaped gland that straddles the trachea in the front of the neck. It develops from an evagination of the floor of the pharynx and a thyroglossal duct marking the path of the thyroid from the tongue to the neck.<sup>3</sup> The two lobes of the human thyroid are connected by a bridge of tissue, the thyroid isthmus, and there is sometimes a pyramidal lobe arising from the isthmus in front of the larynx. The gland is well vascularised, and the portion of the thyroid concerned with the production of thyroid hormone consists of multiple acini or follicles. Each spherical follicle is surrounded by a single layer of polarised epithelial cells and filled with pink-staining proteinaceous material called colloid. Colloid consists predominantly of the glycoprotein, thyroglobulin. When the gland is inactive, the colloid is abundant, the follicles are large, and the cells lining them are flat. When the gland is active, the follicles are small, the cells are cuboid or columnar. Thyroid function is regulated primarily by variations in the circulating level of pituitary TSH.<sup>4</sup> TSH secretion is increased by the hypothalamic hormone thyrotropin-releasing hormone and inhibited in a negative feedback fashion by circulating free T4 and T3. TSH secretion is also inhibited by stress, and in experimental animals it is increased by cold and decreased by warmth.<sup>5</sup>

The thyroid gland is a bilobed structure located in front of neck weighing about 40 grams. It starts functioning at about 10th week of fetal life and plays vital role in tissue metabolism and general growth and development.<sup>6</sup> It secretes three hormones T3, T4 and Thyrocalcitonin. Structurally, thyroid is surrounded by capsule from which septa extends into the gland and divide it into irregular lobes and lobules.<sup>7</sup> The parenchymal cells of thyroid are organised into spherical, blind ending masses called

follicles. In follicles two types of cells are identified: (1) principle or follicular cells, (2) parafollicular or C cells. The release of thyroid hormones T3 and T4 are regulated by a simple feedback system.<sup>8</sup>

### **Aims and Objectives**

Comparison of change in the weight and morphology of thyroid gland in suicidal and non suicidal cases.

### **Material and methods**

The Thyroid glands for this study were taken from autopsies performed on 100 subjects out of which 50 were study subjects and 50 were controls. Study subjects included those cases in which death was due to alleged suicide, where method of suicide were hanging, poison, burns etc., where as control cases included the death other than alleged suicide cases where method of death due to vehicles accidents and assaults etc. After removal, the weight of the gland was recorded, and then the gland collected was preserved in 10 % formalin for more than 2 weeks for fixation. After the period of fixation, grossing of gland was done and slides were prepared and studied.

### **Results**

#### **Age:**

The 50 suicidal cases and 50 non-suicidal cases were included in this study with the age range from 12 to 90 years. The age wise distribution of the cases is shown in Table 1. It is clear from the table that age group 21 to 30 years was the commonest in suicidal cases and 41-50 was commonly involved in non suicidal cases.

#### **Sex:**

Out of 50 suicidal cases, 36(72%) were male and 14(28%) were females and in 50 non-suicidal cases 38(76%) were males and 12(24%) were females (Fig. 1 and Fig 2).

#### **Manner of death:**

Of the 50 suicidal cases, 32 (64%) were of hanging, 17 of poisoning and only 1 case was of burns. Of the 50 non- suicidal cases, 31 (62%) were of accidents, 18 of natural deaths and only 1 case of homicide.

#### **Morphological analysis:**

#### **Weight**

The weight of Thyroid gland (grams) in study and control cases. In study cases maximum weight is 27.6 grams and minimum is 18.5 grams. In control cases maximum weight is 26.5 grams and minimum is 18.7 grams. The mean weight of the thyroid gland in the suicidal group was 22.21 grams and the standard deviation was 2.21 grams whereas the mean weight of the thyroid gland in the non-suicidal group was 22.00 grams and the standard deviation was 1.98 grams. So there was no significant difference between the weight of the thyroid gland in the suicidal and the non-suicidal group.

### Histopathological Changes In Thyroid Gland

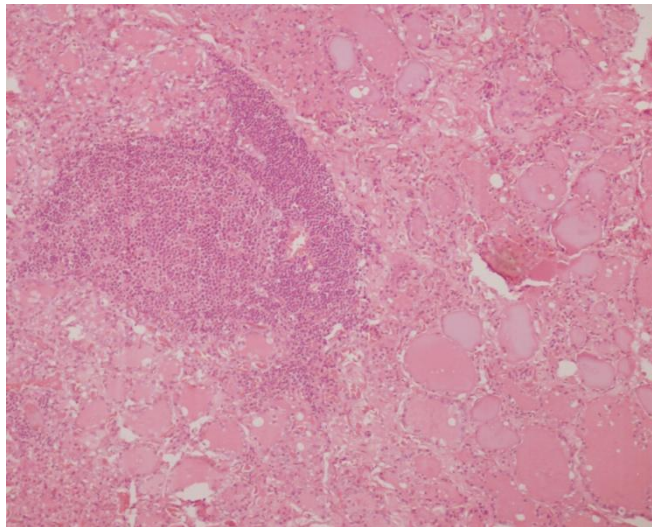
Of 50 study cases, 15 (30%) revealed significant pathological findings and the rest 35 (70%) were histologically normal. 14 of these cases (28%) revealed focal lymphocytic thyroiditis (FLT)(Photo 2) and only 1 case (2%) showed nodular goitre (NG)(Photo 3). The diagnosis of focal lymphocytic

thyroiditis was given in cases which showed lymphomononuclear cell infiltration with lymphoid follicles and destruction of thyroid parenchyma. Out of 14 study cases, in 9 (64%) cases death was due to hanging and in 5 (36%) cases was by ingestion of poison. In one case diagnosis of nodular goitre was given, which showed distended follicle of various sizes filled with colloid and had areas of fibrosis. Of the 50 control cases, 17 (34%) revealed significant pathological findings and the rest 33 (66%) were histologically normal. 16 (32%) of these revealed focal lymphocytic thyroiditis and only 1 case (2%) showed multi nodular goitre (MNG)(Photo 4). Diagnosis of multi nodular goitre was given in one case, which showed multiple fibrosis and nodules having follicles of varying sizes filled with colloid. Of the 16 cases of focal lymphocytic thyroiditis cases, death was accidental in 12 (75%) cases, due to natural causes in 3 (18.7%) cases and homicidal in 1 (6.3%) case.

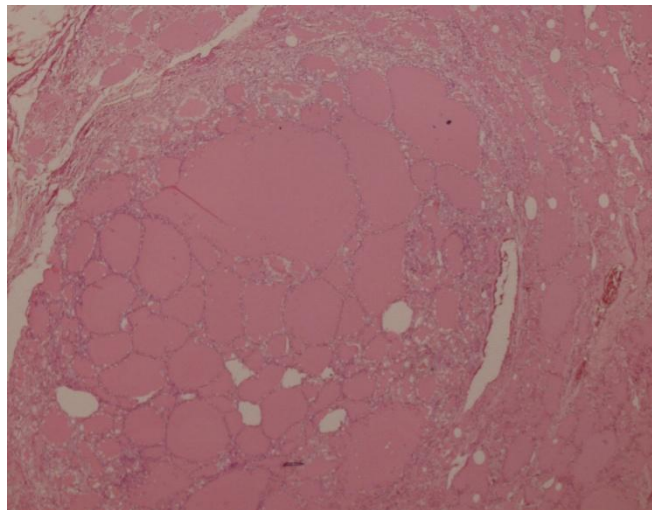
**Photo 1 Show Normal Thyroid Gland**



**Photo 2: Photomicrograph showing focal lymphocytic thyroiditis, lymphomononuclear cell infiltration with lymphoid follicles and destruction of thyroid parenchyma (H&E, X100).**

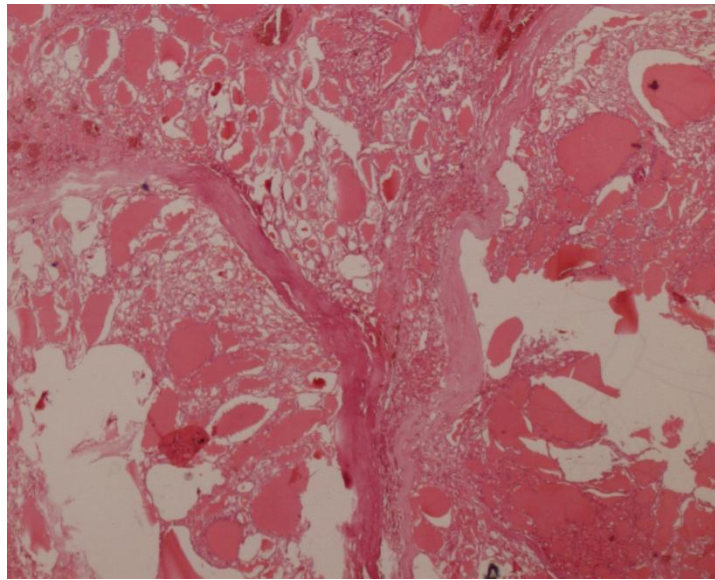


**Photo 3: Photomicrography showing nodular goitre with follicles of various sizes which are distended with colloid and areas of fibrosis (H&E, X40).**



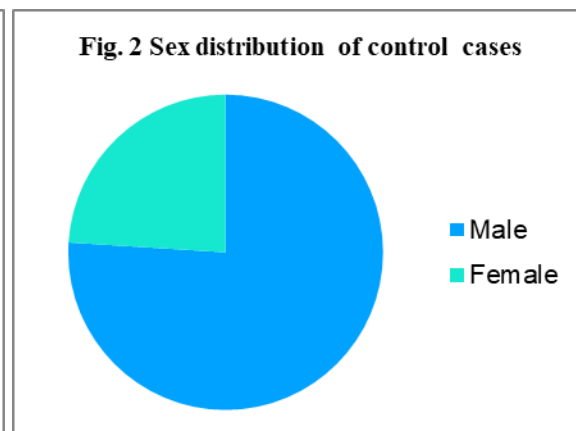
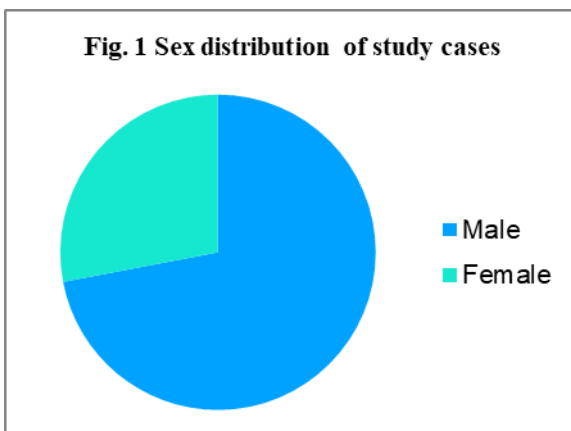


**Photo 4: Photomicrograph showing multiple nodular goitre with multiple fibrous nodules having follicles of varying size filled with colloid (H&E, X40).**



**Table 1: Age wise distribution of cases**

Age Group	Study Cases	Percentage	Control Cases	Percentage
11-20 yrs	10	20%	6	12%
21-30 yrs	15	30%	9	18%
31-40 yrs	10	20%	9	18%
41-50 yrs	7	14%	12	24%
51-60 yrs	5	10%	7	14%
61-70 yrs	3	6%	4	8%
71-80 yrs	0	0	2	4%
81-90 yrs	0	0	1	2%



## Discussion

In our study, thyroid gland weight was measured and was compared between the two groups: suicidal (mean = 22.22, SD=2.21 and p=0.61) and non-suicidal (mean=22.00, SD=1.98 and p=0.61). But there was no significant difference between the studied groups. This finding is not consistent with the study by Charlier, et al.<sup>9</sup> He conducted the study on 576 autopsies, out of which 299 were suicidal cases. From multiple regression model, the oldest group (age >60 yrs) the calculated mean weight of thyroid gland was 20.34 and 17.68 for non-suicidal and suicidal groups (w=3g, p=0.03, for age more than 60 yrs). In age groups <60 yrs the mean weight was 21.37 and 22.11 respectively for general and suicidal groups.

In present study, of the 50 study cases, 14 (28%) were diagnosed with focal lymphocytic thyroiditis and 1 (2%) was diagnosed with nodular goitre. Of the 50 control cases, 16 (32%) were diagnosed with the focal lymphocytic thyroiditis and only 1 case (2%) was diagnosed with multi nodular goitre. This finding of focal lymphocytic thyroiditis is consistent with the study of Cina, et al.<sup>10</sup> and not consistent with the study by Bamousa, et al,<sup>11</sup> Dixit, et al.<sup>12</sup>

In the study conducted by Cina, et al<sup>10</sup>, a series of 169 consecutive autopsies, which includes 81 suicidal cases and 88 non suicidal cases were observed. In only 8 cases, (4.7%) lymphocytic thyroiditis was noted, of which 3 cases were suicidal and 5 cases were from non-suicidal groups. So, there is no evidence which suggest that lymphocytic thyroiditis is associated with the suicidal deaths.

Dixit, et al<sup>12</sup> studied 146 cases of hanging between Jan. 1998 to Dec. 1999. In 20 cases (14%), focal interstitial hemorrhage was noted. We studied all cases of hanging (64%) of the study group but except for the findings of focal lymphocytic thyroiditis no other finding was present.

## Conclusion

This prospective histopathological study was conducted on 50 suicidal cases and 50 control cases brought in mortuary under department of Forensic medicine and Toxicology in alliance with the department of Pathology, GMCH, Chandigarh. It is an effort to correlate the histopathological changes in

various endocrine glands in both suicidal groups and non-suicidal groups.

The interpretations of results in the present study are as follows:

1. 30% of study/suicide cases were in the age group of 21-30 yrs, followed by 20% in both 11-20 yrs and 31-40 yrs. On the other hand, in control groups, 24% were in 41-50 yrs, 18% both in 21-30 yrs and 31-40 yrs.
2. The mean age of the 'suicidal' group was 34.56+14.60 yrs whereas the mean age of the non-suicidal group was 42.82+17.43 yrs.
3. In study group, 64% cases were of hanging, 34% cases of poison and 2% cases were of burn. Out of 50 control cases, 62% died from accident, 36% had died natural death and 2% were of homicide.
4. The finding of focal lymphocytic thyroiditis in both suicidal and non suicidal groups showed no statistically significant difference between the two groups.

There is paucity of studies that could correlate the association of histopathological changes in thyroid gland in suicidal and non-suicidal cases. Larger study group need to be studied to look for any statistical correlation between these.

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