

Research Paper: Thyroid Function Tests and the Serum Levels of Prolactin in Women With Suicide Attempt

Farnaz Rahmani¹, Farzad Rahmani^{2*}, Mitra Niafar², Ali Oštadi³, Navideh Robai¹, Fariba Abdollahi¹, Samira Asadollahi²

1. Research Centre of Psychiatry and Behavioural Sciences, Tabriz University of Medical Sciences, Tabriz, Iran.

2. Endocrine Research Center, Tabriz University of Medical Sciences, Tabriz, Iran.

3. Department of Internal Medicine, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran.



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ABSTRACT

Background: Suicide is a major public health concern across the world. Based on related studies, thyroid dysfunction is associated with psychiatric disorders. This study aimed to determine the relationship between thyroid function tests and serum prolactin in women with suicide attempt.

Methods: A total of 261 women with the suicide attempt were included in this descriptive-analytical study which took over one year (July 2015- July 2016). In addition, the patients' serum Thyroid-Stimulating Hormone (TSH), free T4, and prolactin were measured, too.

Results: Of 261 patients, 44(16.9%) had subclinical hypothyroidism, 3(1.1%) clinical hypothyroidism, and 1(0.4%) hyperthyroidism. The median value of serum prolactin in the patients with decreased thyroid function was higher. There were not significant relationship between suicide attempts and thyroid dysfunction or serum level of prolactin.

Conclusion: Although there was no significant relationship between thyroid test, serum level of prolactin and suicide attempts, the prevalence of thyroid dysfunction and high serum levels of prolactin were clinically significant in women who attempted suicide. Thus, the measurement of serum TSH, free T4 and serum levels of prolactin could be considered for these patients.

1. Introduction

Suicide is an important and complex health problem [1, 2]. A number of psychological, social, cultural and biological factors accounts for this problem [3]. According to WHO, about 804000 suicide deaths have been reported across the world in 2012 [4]. Also,

it is estimated that 153 million people will die from suicide by 2020 [5]. Although the suicide rate is as low as 2 per 100000 in most Islamic countries, evidence shows its rising trend [6]. In Iran, the suicide rates per 100000 people are 5.3 in both sexes, 3.6 in females, and 7.0 in males [4]. Most theories propose a stress model, pointing to specific psychological and biological factors that put a person at risk of suicidal attempt [7].

* Corresponding Author:

Farzad Rahmani, MD

Address: Endocrine Research Center, Tabriz University of Medical Sciences, Tabriz, Iran.

Tel: +98 (413) 5498322

E-mail: Rahmanif@tbzmed.ac.ir

Currently, it is known that thyroid hormones play a vital role in human's brain and affect behaviour and cognition [8, 9]. The interaction between thyroid dysfunction and psychiatric disorders has been well documented [10-12]. A review of studies of refractory depression and thyroid disease reveals that 52% of these patients show some evidence of subclinical hypothyroidism [13].

Prolactin is secreted from the anterior portion of the pituitary gland and its secretion seems to be controlled by the neurotransmitters secreted by the hypothalamus. Inhibition of prolactin secretion by dopamine is of high importance, but its secretion may also be inhibited by noradrenalin and gamma-aminobutyric acid [14].

The most important effect of high prolactin secretion is on sexual activity and its dysfunction problems [15]. Rajkumar conducted a literature review on the prolactin and psychopathology in schizophrenia and found that higher prolactin level is associated with acute episodes of schizophrenia. He concluded that this association needs to be further investigated in larger samples [16]. On the other hand, Pompili et al. reported a difference in the serum levels of prolactin and thyroid hormones in people who attempted suicide and those who did not [17].

With regard to these conflicting results, thyroid function and serum level of prolactin among patients with suicide attempts has not been clearly demonstrated yet. The present study aimed to investigate the thyroid function tests and serum levels of prolactin in women who attempted suicide.

2. Materials and Methods

This is a descriptive-analytical study conducted in the emergency room of the Sina Hospital affiliated to Tabriz University of Medical Sciences from July 2015 to July 2016. This hospital is the referral center for drug poisoning in the province. A total of 800 women were admitted to Sina Hospital for having attempted suicide in this time period. The sample size was determined by Morgan Table [18], since there were no similar studies to refer to. Finally, a sample size of 261 women was determined and recruited using convenient sampling method.

The inclusion criteria were as follows: women who attempted suicide, aged between 18 and 60 years, and declared the patients' suicide attempt. The exclusion criteria included loss of consciousness, altered mental status, history of physical illness, pregnancy, lactation, inability to speak, history of seizures, the use of anti-

seizure drugs and psychiatric drugs affecting prolactin levels, use of anti-thyroid drugs and levothyroxine, patients in need of intubation and intensive care, suicide attempts with drugs that affect thyroid hormones levels, and unwillingness to participate in the research. This study was approved (approval No. 2947) by the Ethics Committee of Tabriz University of Medical Sciences on June 24, 2014. Informed, ethical consent letter for this non-interventional study was obtained from all patients before the study.

Upon the patient's admission into the emergency department, we took 3 mL of blood sample from each patient to determine the serum level of prolactin and do thyroid function tests. The blood serum from samples was removed after centrifugation and maintained in the freezer at 70°C until the serum levels were checked. After preparing the necessary kits, assessment results and abnormalities in the serum levels of these hormones were studied. The kit was procured from Monobind Inc. (Lake Forest, California, USA). The ELISA (enzyme-linked immunosorbent assay) test was used to check the serum level of studied variables. According to manufacturer's instructions, normal serum level for of TSH is between 0.39 and 6.16 μ IU/mL, normal level of free T4 is between 0.2 and 0.8 ng/dL, and the normal levels of prolactin is between 0.39 and 6.16 μ IU/mL. The studied variables included age, marital status, education level, employment status, place of residence (urban or rural), history of suicide and self-harm, method of suicide (drugs, burning materials, hanging, self-injury, etc.), serum levels of TSH, free T4, and prolactin.

All data were analyzed using SPSS 17. The statistical analysis of the derived data and variables is expressed as Mean \pm SD in patients who committed suicide. The Kolmogorov-Smirnov test was used to assess the normal distribution of data. The Independent Samples t test was used to compare quantitative data and Mann-Whitney U test was used in the cases of non-normal distribution. The Chi-square test was used to compare qualitative data. The level of significance was considered at $P>0.05$.

3. Results

A total of 261 women who attempted suicide and were referred to the emergency room of the Sina Hospital of Tabriz University of Medical Sciences, were enrolled as study participants. The age distribution of patients was statistically abnormal. The median age of the patients was 28 years (range:18-58 years).

In terms of marital status, 168(64.4%) patients were married, and 93(35.6%) were single. In terms of the level of education, 155(58.4%) women had high school diplomas and 106(41.6%) had lower education levels. The patients were divided into two groups based on their history of suicide attempts. Of the total sample, 60(23%) patients had a previous history of suicide attempts, while 201(0.77%) did not. Table 1 shows the demographic status and laboratory results of the patients in the two groups. Table 2 compares the data from the two groups of patients. As seen in Table 2, there was a significant relationship between two groups with regard to age.

Considering the non-normal distribution of age variable and serum levels of TSH, free T4 and prolactin, median values along with the first and third quartile variables were used to present the data. The median serum level of prolactin was 21.30 ng/mL, the median level of free T4 was 1.20 ng/mL, and the median serum level of TSH was found to be 2.10 μ IU/mL, for both groups of patients. Patients were divided into two groups based on their suicide history.

Among the studied patients, 149(57.1%) patients had low serum levels of prolactin, while 112(42.9%) patients had high serum levels of prolactin. There was

no significant relationship between serum levels of prolactin and suicide attempts among study participants. In terms of TSH serum levels, 3(1.1%) women had low serum levels, 213(81.6%) had normal levels, and 45(17.2%) had high serum levels. Regarding free T4, 3(1.1%) patients had low serum levels, 257(98.5%) had normal serum levels, and 1(0.4%) patient had high serum levels. Based on the analysis of the results, 213(81.6%) patients were euthyroid, 44(16.9%) patients had subclinical hypothyroidism, 3(1.1%) patients had clinical hypothyroidism, and 1(0.4%) patient had hyperthyroidism. The patients' average serum TSH and free T4 levels were 2.91 μ IU/mL and 1.20 g/dL, respectively. There was also no significant relationship between TSH serum levels, free T4, thyroid function and suicide attempts among study participants.

The median prolactin serum level was 20.20 ng/mL in patients with normal thyroid function, 44.15 ng/mL in patients with subclinical hypothyroidism, 73.10 ng/mL in patients with hypothyroidism, and 35.60 ng/mL in patients with hyperthyroidism. The Kruskal-Wallis H test showed a significant difference between these groups in terms of prolactin serum levels ($P < 0.001$), and the highest median prolactin serum levels was observed in patients with hypothyroidism.

Table 1. Demographic characteristics and laboratory findings of study patients

Variable		Positive Suicide History (60 Patients), No.(%)	Negative Suicide History (201 Patients), No.(%)	P*
Marital status	Married	43(71.7)	125(62.2)	0.219
	Single	17(28.3)	76(37.8)	
Educational Level	Elementary school	4(6.7)	15(7.5)	0.662
	Middle/high school	17(28.3)	70(34.8)	
	Diploma	18(30)	66(32.8)	
	High diploma/BSc	21(35)	50(24.9)	
Job status	Housewife	54(90)	188(93.5)	0.382
	Employee	3(5)	6(3)	
	Self-employed	3(5)	4(2)	
Living place	Student	0(0)	3(1.5)	0.538
	Urban	58(96.7)	187(93)	
	Rural	2(3.3)	14(7)	
Type of ingestion drugs for suicide	Multiple drugs	18(30)	104(51.7)	<0.001
	Acetaminophen	35(58.3)	54(26.9)	
	Benzodiazepine	5(8.3)	25(12.4)	
	Self-burning	0(0)	11(5.5)	
	Anticoagulant	2(3.3)	2(1)	
	Pesticide	0(0)	4(2)	
	Acid/alkali	0(0)	1(0.5)	

* The Chi-square test

Table 2. Comparison of median value of patients' age, serum level of PRL, TSH, and free T4

	Serum Level Variable	Positive Suicide History	Negative Suicide History	p*
Age (y)	First quartile	24.25	19.00	0.007
	Median	31.00	26.00	
	Third quartile	37.00	32.00	
	Mean	30.73	27.65	
Prolactin (ng/mL)	First quartile	13.25	12.45	0.910
	Median	21.90	21.00	
	Third quartile	59.07	47.30	
	Mean	42.43	38.46	
TSH (μ U/mL)	First quartile	1.20	1.10	0.154
	Median	2.35	2.00	
	Third quartile	3.90	3.50	
	Mean	2.82	2.93	
Free T4 (ng/dL)	First quartile	1.00	1.00	0.604
	Median	1.10	1.20	
	Third quartile	1.30	1.40	
	Mean	1.15	1.21	

*Mann-Whitney U test

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4. Discussion

Based on our study results, although there was not significant relationship between suicide attempts and thyroid dysfunction, nearly a quarter of the participants in this study had a thyroid dysfunction. This prevalence of thyroid dysfunction could be clinically significant. Clinical and subclinical thyroid disorders are associated with some psychiatric symptoms and diseases. Suicide attempt, as one of the most important problems especially in psychiatric patients, has a relationship with thyroid function. But many challenges limit full exploration of this relationship and there is no definitive agreement on this issue [8].

The study by Duval et al. showed that free T4 basic level and TSH overnight response rate (in contrast to normal free T3 levels) decreased in patients who had attempted suicide, whereas free T4 and free T3 levels were reported to be normal in patients who had not attempted suicide [19]. In their study, Pompili et al. investigated patients with a history of suicide attempts and found that the average level of free T4 was 33% lower compared with patients without a history of suicide attempts. Also, TSH level in patients with a history of suicide attempts decreased (although not significantly) [17]. According to a study conducted by Jose, suicidal thoughts were associated with increased serum levels of free T4 and not associated with the increase in serum level of prolactin [20]. In another study, free T4 serum levels of greater than 1.15 ng/dL were associated with the patients' current risk of suicide [21]. In this study, approximately 50% of patients with a history of attempted suicide had free T4 serum levels less than this amount.

Similar to no significant relationship between thyroid dysfunction and suicide attempts, there was not a significant relationship between serum levels of prolactin and suicide attempts. On the other hand, there was a high prevalence of prolactin among nearly half of those who attempted suicide, which could be also considered clinically significant. Prolactin levels increase in stressful situations and this increase in women is higher than that in men [22]. Furthermore, it should be noted that both prolactin and thyroid hormones levels would increase to compensate for reduced serotonin and serotonin-related activity. In the study conducted by Pompili, the average serum levels of prolactin in women who had committed suicide was higher compared to women who had not committed suicide. Both these values are close to normal levels and not statistically significant [17]. In the present study, high levels of prolactin were observed in the patients with decreased thyroid function. Likewise, some studies reported that prevalence of hyperprolactinemia in subclinical hypothyroidism is notable and this disorder is more common in women with subclinical hypothyroidism compared to men with the same problem [23, 24].

One of the limitations of the present study is the lack of a control group to compare the results. Another limitation the present study is the failure to comply with the checking conditions of the serum levels. A third limitation is the lack of recording of the psychiatric consultation results. Despite these shortcomings, the study has its own merits. One of the strengths of the study is its large sample size. Also, based on the search conducted on the databases, it is the first study that examines the function of the thyroid gland and hormone prolactin in

patients with and without a history of suicide attempts or chronic drug use.

5. Conclusion

In conclusion, there was no significant relationship between thyroid dysfunction or serum level of prolactin and attempted suicide in women. However, the prevalence of thyroid dysfunction and high serum level of prolactin are clinically significant in women who attempted suicide. Considering the likelihood of association between thyroid dysfunction and hyperprolactinemia in suicidal people, further studies are needed to clearly explore the relationship between these variables. It is suggested that future studies be designed to explore the causal association between attempted suicide, thyroid dysfunction and the serum level of prolactin.

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Conflict of Interest

The authors declared no conflicts of interest.

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