



Low serum free thyroxine level is correlated with lipid profile in depressive patients with suicide attempt

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ABSTRACT

The present research was carried out to observe the relationships between serum free triiodothyronine (FT3), free thyroxine (FT4), thyroid-stimulating hormone (TSH) levels and lipid profile and suicide risk in depressive subjects. Serum concentrations of albumin, total bilirubin, uric acid, total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL), low-density lipoprotein cholesterol (LDL), high-sensitivity C-reactive protein (hs-CRP), FT3, FT4 and TSH were measured in 271 patients meeting the DSM-IV criteria for major depressive disorder (202 subjects without suicidal behavior and 69 suicide attempters). A significant decrease in serum TC, TG and FT4 levels was found in suicide attempters with major depressive disorder compared with non-suicide attempters (all $p < 0.0025$). For the other biochemical factors levels (albumin, total bilirubin, uric acid, HDL, LDL, hs-CRP, FT3, and TSH), there were no significant differences between suicide attempters and non-suicide attempters. Relativity analysis suggested that FT4 is positively and significantly correlated with TC ($p < 0.0025$); TSH is positively associated with HDL ($p < 0.0025$). Univariate analysis showed that serum TC and FT4 abundances are correlated with the suicide attempts in major depressive subjects. This research demonstrated that the levels of serum TC, TG, and FT4 levels in suicidal patients were greatly decreased compared with patients without suicidal behavior. These findings support the hypothesis that low serum FT4 level affects lipid profile in major depressive patients with suicidal attempt.

1. Introduction

Major depressive disorder (MDD) is a severe, complex, and recurrent psychiatric disease. Multiple factors appear to be involved in the pathogenesis of MDD, but the roles of genetic, environmental, and social factors in the occurrence of depression have been extensively studied (Caspi et al., 2003). In a survey on the global health system (Nock et al., 2008), MDD is a common disorder with lifetime prevalence approximately 3–17% of the global population. Suicide accounts for approximate 1–2% of global deaths, regarding it as the 15th leading cause of mortality (World Health Organization., 2016). The contribution of a combination individual and social factors to the suicidal risk is greatly discussed (Center for Disease and Control Prevention., 2016), but the suicidal behaviors, such as ideation, attempts, and completion, are often correlated to MDD (Hawton et al., 2013).

Extensive investigations have focused on identifying biological markers which could be correlated to MDD and suicide behavior, and could be considered as an effective tool for preventing suicide (Asellus et al., 2010; Lee et al., 2011; Pandey et al., 2013). Some researches have demonstrated that patients with MDD were found to have abnormal

levels of lipids. Several studies have analyzed the association among plasma or serum total cholesterol concentrations and suicide attempt, and the inconsistent results have been demonstrated (Golomb et al., 2000; Kim et al., 2002; Takei et al., 1994). Some results displayed that there is a relationship between low total cholesterol level and suicidal behavior, however, other studies have shown negative relationship between suicidal ideation, suicidal attempt, completed suicide and cholesterol level. In addition, several researches have indicated that lower TG level was significantly correlated to suicidal attempt in depressive patients (Vuksan-Cusa et al., 2009; Cantarelli et al., 2015), while the levels HDL cholesterol and LDL cholesterol among suicide attempters and non-suicide attempters with major depressive disorder unchanged (Cantarelli et al., 2015).

So far, observations of the association between suicidal attempt and hypothalamic-pituitary-thyroid (HPT) axis activating are scarce and these results are inconsistent. A study has suggested that lower HPT axis activity is correlated to the suicide attempt (Duval et al., 2017). However, the relationships between serum free triiodothyronine (FT3), free thyroxine (FT4), thyroid-stimulating hormone (TSH) levels and lipid profile and suicide risk in depressive subjects have not been reported.

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Therefore, in the current study, we analyzed the thyroid hormones level, TSH level, and lipid profile in suicide attempters and non-suicide attempters with MDD. We aimed to identify whether altered levels of thyroid hormones and TSH are associated with lipid profile in depressive patients with suicide attempt.

2. Materials and methods

2.1. Subjects

This research has recruited 271 patients with major depressive disorder according to a Structured Clinical Interview for DSM-IV (SCID). All patients were divided into two groups: 202 subjects with a major depressive episode without suicidal behavior incorporated during the consultations in the department of psychiatry, Renmin hospital of Wuhan university, and 69 suicidal attempters incorporated after a suicide attempt. Sociodemographic material, lifestyle factors (cigarette consumption and alcohol use), duration of symptoms, and antidepressants treatment were also consulted with a questionnaire. Only the age of subjects ranging from 18 to 65 years were recruited into this research. The patients treated for dyslipidemia, hypertension, or/and diabetes were excluded from this research. All patients provided written informed consent and this research was approved by the medical ethics review committee of Renmin hospital of Wuhan university.

2.2. Psychiatric evaluation

The diagnosis of the major depressive disorder was performed by the diagnostic and statistical manual of mental disorders (DSM-IV). Hamilton depression rating scale (HDRS) and the Beck's suicidal ideation scale (SSI) were also used to assess the severity of depressive symptoms. Suicide was defined as a conscious intent of the depressed patients to end their life, however ambivalent, through means that the patient thought could lead to death. However, the patients who have tried to kill themselves with a drug overdose were removed.

2.3. Analytical methods

Blood samples were drawn between 8 and 9 am after without food consumption for at least 8 h. For suicidal subjects, blood samples were collected within 24 h after the suicide attempt. The levels of albumin (sensitivity: 0.01 g/L; specificity: cross reactivity < 0.02%), total bilirubin (sensitivity: 0.01 μ mol/L; specificity: cross reactivity < 0.01%), uric acid (sensitivity: 0.3 μ mol/L; specificity: cross reactivity < 0.02%), TC (sensitivity: 0.2 mmol/L; specificity: cross reactivity < 0.02%), TG (sensitivity: 0.1 mmol/L; specificity: cross reactivity < 0.02%), HDL-C (sensitivity: 0.1 mmol/L; specificity: cross reactivity < 0.02%), LDL-C (sensitivity: 0.1 mmol/L; specificity: cross reactivity < 0.01%), Lp(a) (sensitivity: 0.01 mmol/L; specificity: cross reactivity < 0.01%), and hs-CRP (sensitivity: 0.01 mmol/L; specificity: cross reactivity < 0.01%) were measured using a Siemens Advia 2400 automatic biochemistry analyzer (Siemens, Erlangen, Germany). FT3 (sensitivity: 0.2 ng/L; specificity: cross reactivity < 0.02%), FT4 (sensitivity: 1 ng/L; specificity: cross reactivity < 0.02%), TSH (sensitivity: 0.01 mIU/L; specificity: cross reactivity < 0.01%) levels were analyzed using a Siemens Advia Centaur CP (Siemens, Erlangen, Germany).

2.4. Statistical analysis

The statistical analyses were carried out using SPSS 20.0 for Windows. All variables were showed as mean \pm standard deviation (SD). Differences in age, BMI, daily smoking, alcohol use, gender, albumin, total bilirubin, uric acid, TC, TG, HDL, LDL, Lp(a), and hs-CRP were assessed by independent *t*-tests. Relativity analyses among FT3, FT4, TSH levels and lipid profile in depression were assessed using Spearman correlation analyses. Univariate and multivariate logistic

Table 1

Characteristics of biochemical data between non-suicide attempters and suicide attempters.

	Non-suicide attempters (n = 202)	Suicide attempters (n = 69)	<i>p</i>
Age (years)	36.39 \pm 15.73	36.35 \pm 15.54	0.986
BMI	25.63 \pm 8.21	23.67 \pm 7.02	0.325
Daily Smoking (%)	16.47	18.39	0.473
Alcohol Use (%)	10.62	9.04	0.569
Male (%)	38.64	40.06	0.472
Duration of symptoms (years)	3.93 \pm 5.90	3.21 \pm 4.49	0.357
Albumin (40–55 g/L)	42.88 \pm 3.50	42.09 \pm 3.68	0.708
Total bilirubin (2–22 μ mol/L)	11.65 \pm 6.25	12.20 \pm 5.90	0.527
Uric acid (155–357 μ mol/L)	325.11 \pm 231.58	300.52 \pm 76.33	0.388
TC (3.1–5.2 mmol/L)	4.08 \pm 0.91	3.56 \pm 0.69	< 0.001
TG (0.56–1.70 mmol/L)	1.26 \pm 0.93	0.89 \pm 0.42	0.002
HDL (1.00–1.55 mmol/L)	1.22 \pm 0.31	1.23 \pm 0.31	0.715
LDL (1.9–3.1 mmol/L)	2.20 \pm 0.73	2.20 \pm 0.66	0.967
TC/HDL	3.52 \pm 1.09	3.42 \pm 0.84	0.471
Lp(a) (0–300 mg/L)	150.393 \pm 176.85	148.80 \pm 160.60	0.948
Hs-CRP (0–3 mg/L)	0.84 \pm 2.12	0.82 \pm 2.46	0.960
FT3 (2.3–4.2 ng/L)	3.14 \pm 0.47	3.05 \pm 0.40	0.182
FT4 (8.9–18.0 ng/L)	12.0 \pm 2.3	9.7 \pm 2.9	< 0.001
TSH (2.3–4.2 IU/L)	1.92 \pm 1.49	1.35 \pm 0.60	0.003
Treatment			0.715
ISRS	73 (36.1%)	23 (33.3%)	
Tricyclic	54 (26.7%)	15 (21.7%)	
Mood stabilizers	52 (25.7%)	18 (26.1%)	
Antipsychotics	68 (33.7%)	25 (36.2%)	
Benzodiazepine	46 (22.8%)	13 (18.8%)	

BMI: body mass index; TC: total cholesterol; TG: triglyceride; HDL: high-density lipoprotein cholesterol; LDL: low-density lipoprotein cholesterol; Lp(a): Lipoprotein(a); hs-CRP: high-sensitivity C-reactive protein; FT3: free triiodothyronine; FT4: free thyroxine; TSH: thyroid-stimulating hormone.

regression analyses were carried out to investigate the relationship between suicide attempt and the related factors. The relationship between FT4 level and lipids were further carried out by multiple linear regression analyses. All *p* values are two-sided and < 0.0025 were considered as statistically significant.

3. Results

3.1. Characteristics of depressive patients

Demographic characteristics of non-suicide attempters and suicide attempters with major depressive disorder are shown in Table 1. There were no significant differences between non-suicide attempters and suicide attempters with major depressive disorder regarding age, BMI, duration of depressive symptoms, and the percentages of cigarette consumption, alcohol use and gender (all *p* > 0.025).

The average serum level of TC was significantly higher in non-suicide attempters than suicide attempters (*p* < 0.001). The mean serum level of TG in non-suicide attempters was significantly increased compared with suicide attempters (*p* = 0.002). Moreover, the levels of FT4 (*p* < 0.001) in suicide attempters were all significantly decreased compared with non-suicide attempters. However, the levels of albumin, total bilirubin, uric acid, HDL, LDL, Lp(a), hs-CRP, FT3 and TSH unchanged among non-suicide attempters and suicide attempters (all *p* > 0.025). Furthermore, we analyzed the situation of treatment for antidepressants or other medications before 1–2 months prior to recruitment. The proportion of each drug between non-suicide attempters and suicide attempters has no statistical differences, indicating that the potential effects of drug on the biological measures were parallel among

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