

Vilma Liaugaudaite – Associations of suicide rates and affective disorders with lithium levels in drinking water



Vilma Liaugaudaite has master degree in Public Health (2012). In 2016 started PhD studies at the Lithuanian University of Health Sciences and on 9th April of 2021 defended her PhD thesis on „Associations of suicide rates and affective disorders with lithium levels in drinking water“. Dr. Liaugaudaite works as a junior scientist in laboratory of Behavioural Medicine, Neuroscience Institute at Lithuanian University of Health Sciences.

INTRODUCTION

Suicide is a serious global public health problem that demands our attention but preventing suicide is no easy task. Suicide is the second leading cause of death among 15–29 year olds globally and one of the most important indicators of the public's state of mental health. Suicide is a complex phenomenon with many contributing factors including psychological, social, economic, biological, and environmental. However, mental health disorders are also attributed to a significant number of indirect deaths through suicide and self-harm. Suicide deaths are strongly linked, although not always attributed to mental health disorders. There is strong evidence that suicide mostly occurs among people with affective disorders. The suicide risk has been estimated at 6–10% in the affective disorder population, which is 10 times the corresponding risk in non psychiatric populations. Treatment of patients with suicidal behavior is one of the most challenging tasks for health-care professionals. In clinical practice it is well established that lithium has a mood-stabilizing and suicide-preventive effect in individuals suffering from affective disorders. Although trace lithium intake doses are significantly lower than those used for the treatment of patients with psychiatric disorders, there is growing evidence that even very low lithium levels induced by routine consumption of lithium from tap water may have anti-suicidal effects both in patients with affective disorders, and in the general population. One hypothesis explaining anti-suicidal effects of low lithium levels is that longterm exposure to lithium through routinely drinking water may mitigate low absolute lithium levels. In addition, lithium appears to have value in augmenting antidepressant treatment. Lithium continues as the standard and most extensively evaluated treatment for bipolar disorder, especially for long-term prophylaxis. Several epidemiologic studies have reported that lithium in drinking water may be associated with lower rates of suicide mortality, lower incidence of dementia, lower levels of adolescents' depression, aggression and psychotic experiences at the population level. Despite this interest, none of the studies, to the best of our knowledge has studied the interaction between the suicide rates, prevalence of mental and behavioral disorders and naturally occurring lithium in drinking water. Based on the existing knowledge we hypothesized that higher levels of lithium in drinking water may exert an anti-suicidal effect in the population with high incidence of affective disorders.

THE AIM

To establish whether suicide rates and incidence of affective disorders are associated with lithium levels in drinking water.

OBJECTIVES

1. To examine the lithium levels in drinking water in Lithuanian municipal central wellfields.
2. To investigate the association of suicide mortality rates with lithium levels in drinking water.
3. To evaluate whether incidence of affective disorders is associated with lithium levels in drinking water.

CONCLUSIONS

1. The mean lithium concentration in the public drinking water samples of central wellfields in Lithuanian municipalities was 11.5 (SD 9.9) $\mu\text{g/L}$ ranging from 1.0 to 39.0 $\mu\text{g/L}$, median – 7.0 (IQR 3.5–20) $\mu\text{g/L}$. Lithium levels in central drinking water systems are differently distributed across Lithuania. The lowest lithium levels are observed in the Eastern Lithuania, Žemaitija and Šilutė, while the highest in regions of Central Lithuania, Northern Lithuania and Klaipėda.

2. Lithium levels in the public drinking water are associated with suicide SMR in a nonlinear way. The inverted U-shaped curvilinear relationship is confirmed between higher lithium level in drinking water and lower suicide SMR even after controlling for socio-demographic characteristics. Lithium levels in drinking water are negatively associated with suicide SMR only when the lithium level is higher certain value (14.5 $\mu\text{g/L}$). A similar effect of lithium in drinking water was found on women suicide SMR, with no such association observed for men.

3. Lithium levels in drinking water are positively associated with the incidence of affective disorders. The present findings suggest higher incidence rates of affective disorders in the municipalities with a lithium level in drinking water above median compared to the municipalities with a lithium level below median and with the same socio-demographic and psychiatric characteristics. Suicide SMRs are inversely associated with lithium levels in drinking water only in municipalities with higher lithium levels (above median) and with a high rate of affective disorders.