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Association between natural exposure to lithium and suicide rate: an ecological and human biomonitoring study in northern Portugal

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Several studies have found an inverse relationship between lithium levels in drinking water and the suicide rate in the general population [1,2]. However, this observation has failed in other studies [3], including in Portugal [4], and there seems to be a threshold concentration (30 µg/L) above which this “protective” effect of lithium becomes noticeable [3].

The main limitation of these “ecological” studies is that they assume a direct association between lithium concentration in drinking water and population lithium intake. However, other sources can significantly contribute to the total daily intake of lithium, namely various dietary sources.

Determination of urinary lithium levels may be a better approach in the study of this issue (the possible association between natural lithium exposure and suicide rates), by allowing a more accurate assessment of actual lithium intake by the general population.

In this context, we conducted a comparative study between two regions of northern Portugal with very different relative risk (RR) for suicide, according to a study by Loureiro et al. [5], roughly corresponding to the metropolitan area of Porto (“AMP”; west/coast, with the lowest RR nationally: 0.28) and the region of Trás-os-Montes (“TM”; northeast, with the third highest RR: 1.67). The study included both the determination of lithium concentration in water samples (from domestic public supply and other sources, including surface water) and in urine samples from individuals residing in the two regions.

There was no clear inverse association between lithium levels and the RR of suicide. The *median* concentration in **water** was slightly higher in the region with the lowest RR (AMP) [3.4 µg/L (n=59) vs. 2.5 µg/L (n=72)], but the *median* concentration in **urine** was lower [22.6 µg/L (n=131) vs. 27.5 µg/L (n=51)]. However, in this region (AMP) a significantly higher percentage of individuals with high lithium urinary levels (> 80 µg/L) was found: 15% (20/131) vs. only 6% (3/51). The reasons for this large inter-individual variability in urinary lithium levels should be investigated.

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