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Associations of acetylcholinesterase activity with depression and anxiety symptoms among adolescents growing up near pesticide spray sites

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Highlights

- Low acetylcholinesterase (ACHE) is a marker of increased pesticide exposure.
- We examined 529 11-17 year-olds living near flower production sites in Ecuador.
- Lower AChE was related to increased depressive symptoms but not to anxiety symptoms.
- Associations were strong
- Pesticide exposure may c

Abstract

Background

The cholinergic system has a
pesticides (e.g. organophosphates) appear to increase depression and anxiety symptoms in the few existing animal and human studies. Human studies have not described such associations using biomarkers of exposure and studies among children are needed.

Methods

We studied 529 adolescents (ages 11-17y) in agricultural communities in the Ecuadorian Andes (ESPINA study). Acetylcholinesterase (AChE) activity was measured in a finger-stick sample. Anxiety and depression symptoms were assessed using the CDI-2 and MASC-2 (greater scores reflect greater internalizing symptoms). Models adjusted for age, gender, hemoglobin, income among others.

Results

The median age was 14.38y and 51% were female. The mean (SD) of the following parameters were: AChE 3.7 U/mL (0.55), depression T-score 53.0 (9.4) and anxiety T-score: 57.6 (9.8). Lower AChE activity (reflecting greater cholinesterase inhibitor exposure) was associated with higher depression symptoms (difference per SD *decrease* of AChE [β [95% CI:]]: 1.09 [0.02, 2.16]), was stronger among girls (β = 1.61) than boys (β = 0.69), and among younger (<14.38y, β = 1.61) vs. older children (β = 0.57). The associations were strongest among girls <14.38y (β = 3.30 [0.54, 6.05], OR for elevated symptoms per SD decrease in AChE = 2.58 [1.26, 5.27]). No associations were observed with anxiety scores. Analyses of AChE change between 2008 and 2016 concurred with these findings.

Discussion

We observed associations between a biomarker of pesticide exposure and children's depression symptoms. Lower AChE activity may create risk for depression in teenagers, particularly among girls during early adolescence.

Previous

Keywords

Depression; Anxiety; Pesticide

Abbreviations

AChE, acetylcholinesterase activity

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