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Pesticide exposure and thyroid function in elementary school children living in an agricultural area, Brebes District, Indonesia

(Article) (Open Access)

Suhartono, S.[a], Kartini, A.[b], Subagio, H.W.[c], Budiyono[a], Utari, A.[d], Suratman, S.[e], Sakundarno, M.[f,g]

[a]Department of Environmental Health, Faculty of Public Health, Diponegoro University, Semarang, Indonesia
[b]Department of Public Health Nutrition, Faculty of Public Health, Diponegoro University, Semarang, Indonesia
[c]Department of Nutrition, Faculty of Medicine, Diponegoro University, Semarang, Indonesia

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Abstract

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Background: Children living in agricultural areas are at risk of exposure to pesticides due to their involvement in agricultural activities. Pesticides are one of the chemicals classified as endocrine disrupting chemicals. Objective: To examine the association between exposure to organophosphate pesticides and the occurrence of thyroid dysfunction in children. Methods: This cross-sectional study was conducted on 66 children in two elementary schools located in an agricultural area in Brebes District, Indonesia, in 2015. To determine the pesticide exposure history, we analyzed urine samples and completed a questionnaire. Meanwhile, thyroid function tests were performed. Results: Organophosphate pesticide metabolites were detected in urine samples of 15 (23%) of 66 children. Thyroid stimulating hormone (TSH) levels >4.5 μIU/mL were detected in 24 (36%) children. Free thyroxine (FT4) levels of all participants were normal. The mean TSH level in children with positive urinary organophosphate pesticide metabolites (7.74 μIU/mL) was significantly (p=0.005) higher than that in those who were negative (4.34 μIU/mL). The prevalence of hypothyroidism in children with positive urinary organophosphate pesticide metabolites (67%) was significantly higher than that in those who were negative (27%; PR 2.4, 95% CI 1.4 to 4.3). Conclusion: A history of pesticide exposure could be used as a risk factor for the occurrence of thyroid dysfunction in children living in agricultural areas.

SciVal Topic Prominence

Topic: Hypothyroidism | Thyroid Gland | Subclinical hyperthyroidism

Prominence percentile: 96.468

Author keywords

Agriculture Child Hypothyroidism Indonesia Organophosphates Pesticides Thyroid function test

Indexed keywords

EMTREE drug terms: 3 diethyl alkyl phosphate, 3 dimethyl alkylphosphate, diethyl dithiophosphate, diethyl phosphate, diethyl thiophosphate, dimethyl phosphate, dimethyldithio phosphate, dimethylthio phosphate, drug metabolite, long acting thyroid stimulator, organophosphate pesticide, pesticide, thyrotropin, unclassified drug, insecticide, pesticide

EMTREE medical terms: agriculture, Article, chemiluminescence immunoassay, child, cross-sectional study, electrochemiluminescence, exposure, female, free thyroxine index, human, hypothyroidism, interview, male, occupation, prevalence, school child, thyroid function, thyroid function test, urinalysis, analysis, drug effect, environmental exposure, epidemiology, Indonesia, physiology, population, questionnaire, rural population, school, statistics and numerical data, student, thyroid gland, urine

MeSH: Agriculture, Child, Cross-Sectional Studies, Environmental Exposure, Female, Humans, Indonesia, Insecticides, Male, Pesticides, Population, Rural Population, Schools, Students, Surveys and Questionnaires, Thyroid Function Tests, Thyroid Gland

Chemicals and CAS Registry Numbers:

long acting thyroid stimulator, 9034-48-4; thyrotropin, 9002-71-5;

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Suhartono, S.; Department of Environmental Health, Faculty of Public Health, Diponegoro University, Semarang, Indonesia; email:suhartono_damas@yahoo.com

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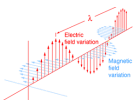

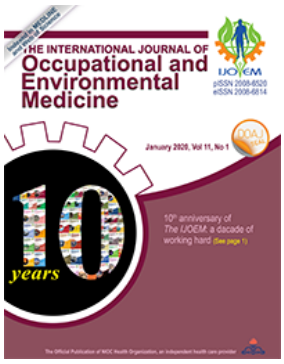

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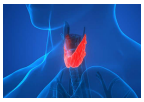

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Pesticide Exposure and Thyroid Function in Elementary School Children Living in an Agricultural Area, Brebes District, Indonesia

Suhartono Suhartono, Apoina Kartini, Hertanto Wahyu Subagio, Budiyono Budiyono, Agustini Utari, Suratman Suratman, Mateus Sakundarno

Abstract

Background: Children living in agricultural areas are at risk of exposure to pesticides due to their involvement in agricultural activities. Pesticides are one of the chemicals classified as endocrine disrupting chemicals.

Objective: To examine the association between exposure to organophosphate pesticides and the occurrence of thyroid dysfunction in children.

Methods: This cross-sectional study was conducted on 66 children in two elementary schools located in an agricultural area in Brebes District, Indonesia, in 2015. To determine the pesticide exposure history, we analyzed urine samples and completed a questionnaire. Meanwhile, thyroid function tests were performed.

Results: Organophosphate pesticide metabolites were detected in urine samples of 15 (23%) of 66 children. Thyroid stimulating hormone (TSH) levels >4.5 µIU/mL were detected in 24 (36%) children. Free thyroxine (FT4) levels of all participants were normal. The mean TSH level in children with positive urinary organophosphate pesticide metabolites (7.74 µIU/ mL) was significantly (p=0.005) higher than that in those who were negative (4.34 µIU/mL). The prevalence of hypothyroidism in children with positive urinary organophosphate pesticide metabolites (67%) was significantly higher than that in those who were negative (27%; PR 2.4, 95% CI 1.4 to 4.3).

Conclusion: A history of pesticide exposure could be used as a risk factor for the occurrence of thyroid dysfunction in children living in agricultural areas.

Keywords

Pesticides; Thyroid function test; Child; Agriculture; Indonesia; Organophosphates; Hypothyroidism

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