



Thyroid Disorders as a Factor Related for Stunting: A Literature Review

Septi Wardani^(✉) and Dwi Sulistyono

Pediatric Nursing, Universitas Muhammadiyah Magelang, Magelang, Indonesia
septiwardani@ummgl.ac.id

Abstract. Stunting is a nutritional problem that has multifactorial causes. These multifactorial causes include poor nutritional intake, genetic factors and hormonal problems. Thyroid disorders are one of the hormonal problems that cause stunting. This literature review is to describe whether thyroid disorders are a factor associated with stunting in children. The literature search used two databases, namely pubmed and google scholar, with the keywords stunting, thyroid disorders. The focus of the selection of articles is original research, in English and published from 2021 to 2022, with the criteria for stunting children. The results of the literature review showed that from 3,500 children, 13.4% were stunted, and as many as 872 children or 25% of children had thyroid disorders, and from the results of this literature review, it was conveyed that there was a relationship between thyroid disorders and the incidence of stunting in children.

Keywords: Stunting; Thyroid disorders; Related factors

1 Introduction

A growth problem known as stunting is defined by short length or height for age, or less than -2 standard deviations. Multiple variables, including as inadequate dietary intake in terms of quantity and quality, excessive morbidity, or a combination of the two, can result in stunting. In nations with low and intermediate incomes, this syndrome is frequently seen. Stunting will result from inadequate ingestion of macro- and micronutrients, particularly during the growth phase. Stunting is impacted by hereditary factors, recurring (chronic) diseases such acute respiratory infections (ARI), and diarrhea in addition to dietary considerations. Genetic, environmental, dietary, and hormonal variables interact intricately to cause normal development. At the cellular level, these three elements interact to promote growth. Growth hormone, sometimes known as "Growth Hormone," is crucial to this procedure. The interactions between the hypothalamo-pituitary-GH-IGF (insulin-like growth factor) and other hormones, including as thyroid hormones, sex steroids, and glucocorticoids, as well as psychosocial variables, affect growth [1].

Thyroid disorders, such as hypothyroidism, are one of the factors that cause stunting. Hypothyroidism occurs when not enough thyroid hormone is produced. The thyroid is a small, butterfly-shaped gland located at the front of the neck. These glands secrete

hormones that help the body regulate and use energy. The thyroid also controls the function of several organs to work properly. Low thyroid hormone can cause the body's natural functions to slow down. Hypothyroidism is also caused by low consumption of iodine.

Thyroid disorders that cause stunting are not only experienced by children, but starting from intrauterine, where pregnant women who experience thyroid disorders are very at risk of having stunting children. Previous studies have described the causes of stunting, but have not shown much that thyroid disorders are associated with stunting. This study aims to describe whether thyroid disorders are a factor associated with stunting in children.

2 Method

The literature search used two databases, pubmed and google scholar, by using the PICO technique in article search. From these two databases, we found 152 articles. Then we identified these articles using a prism diagram, and found 5 articles that met the inclusion criteria. The keywords entered are stunting, thyroid disorders. The selected articles focus on original research, in English and published from 2021 to 2022, with inclusion criteria: the subject is a stunted child or a mother who has a stunted child.

Data extraction was carried out on all articles found, with the selection of: first author, year, place of study, destination, population, stunting and thyroid disorders. The purpose of this literature analysis is to describe whether thyroid disorders are a factor associated with the incidence of stunting in children.

3 Result and Discussion

3.1 Result

The literature search results found 80 articles from pubmed and 72 articles from Google Scholar. From 152 articles found 80 relevant articles. Of the 80 articles, 5 articles met the inclusion criteria, shown in Fig. 1. Table 1 describes the research design and character of the reviewed articles.

3.2 Discussion

From the results of the review article, there is a relationship between thyroid disorders and the incidence of stunting in children. Children with thyroid disorders, such as hypoparathyroidism, have constitutional growth retardation or impaired nutritional status due to some congenital abnormalities after birth and growth hormone deficiency [6]. Another thyroid disorder is parathyroid hormone deficiency. Parathyroid Hormone-related Protein (PTHrP) plays an important role in the growth of children, one of which plays a role in the growth of teeth. Damage to the parathyroid glands in short children can lead to PTHrP deficiency. PTHrP and vitamin D play a role in maintenance and affect calcium levels. Deficiency of PTHrP and vitamin D levels can lead to decreased

absorption of calcium in the blood. Calcium deficiency in children can cause a decrease in the number of osteoclasts and osteoblasts, which can affect bone growth and tooth eruption patterns. This is what causes stunting in children, impaired bone and tooth growth due to PTHrP deficiency [6].

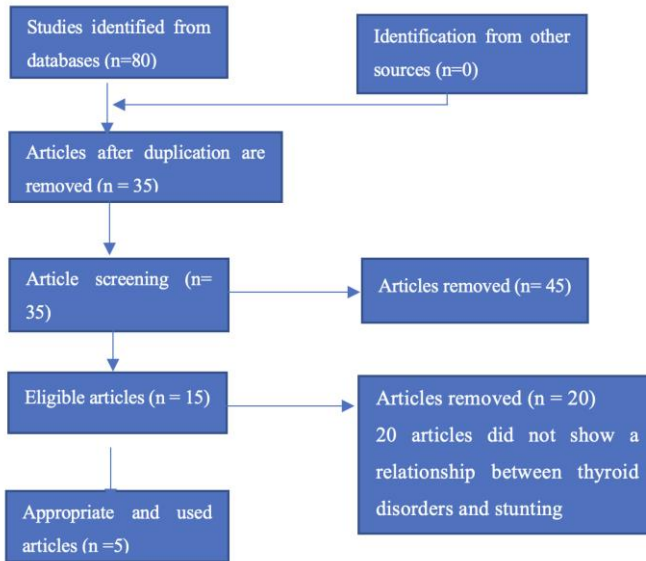


Fig. 1. Prisma Diagram

Hypothyroidism is a cause of stunting, one of which begins during pregnancy. In mothers who suffer from hypothyroidism during pregnancy, it will cause intrauterine growth restriction and mild deficits in fetal neurodevelopment. When hypothyroidism occurs in early pregnancy, there can be behavioral changes and decreased cognitive abilities in the offspring, as well as delays in psychomotor development and impaired intellectual development. The presence of thyroid disorders during pregnancy is also a cause of cognitive and motor disabilities, growth retardation, and hearing and speech defects in children born [7].

Hormonal conditions, like hypocalcemia, can cause thyroid issues, which are common in children who are stunted. In addition to hypoparathyroidism and hypothyroidism, which are brought on by the parathyroid and thyroid glands' diminished activity, hypocalcemia is also brought on by calcium receptor resistance in cell membranes. Growth hormones such Growth Hormone (GH), Thyroid Stimulating Hormone (TSH), Luteinizing Hormone (LH), and Adrenocorticotrophic Hormone (ACTH), which are involved in the production of Insulin Growth Factor-1 (IGF-1), are less secreted when thyroid hormone activity is reduced. While this is going on, a malfunctioning parathyroid gland results in a drop in parathyroid hormone (PTH), which can interfere with calcium's homeostasis and cause a drop in blood calcium levels. Stunting results from bone development mechanisms such direct ossification through intramembranous bone formation, indirect endochondral ossification, and increase of bone mass by apposition and deposition of bone matrix. Endochondral ossification, which can result in stunting,

is influenced by growth hormone (GH), triiodothyronine (T3), androgen and estrogen hormones, vitamin D with parathyroid hormone, and other factors [6].

Table 1. Design and Characteristics of the Study [1], [2], [3], [4], [5]

Author and Location	Hastuti, et al Cangkringan Sleman Yogyakarta Indonesia	Abri, et al Kabupaten Enrekang Sulawesi	Abbag, et Althe Ascet Re- gion, Southwest- ern Saudi Arabia	Nur, et al Kabupaten en- rekang	Kartini, et al Daerah agri- cultural di In- donesia
Aim	To assessing the incidence of hypothyroidism due to iodine deficiency and its relationship with the incidence of stunting on the slopes of Mount Merapi	To identify the determinants of stunting in elementary school children in IDD endemic areas	Investigating the incidence of stunting and exploring the role of iodine deficiency disorder as a predictor of stunting among primary school children	To see the relationship between disorders due to iodine deficiency (IDD) and stunting with cognitive development in elementary school children	To find out whether pesticide exposure is associated with stunting in children in agricultural areas.
Population	94 Mothers and 94 children	100 Mothers and their children aged 6-12 years	3.046 school age students	100 respondents aged 6-12 years	160 children aged 8-12 years
Stunting incident	30 out of 94 children were stunted, with 19.1% short, and very short 12.8%	72 out of 100 children are stunted	238 school-age children had an HAZ of less than 2, giving a stunting prevalence of 7.8% (95% CI: 6.9-8.8%).	Respondents with stunting were 72%, consisting of very short (19%) and short (53%)	52 children are stunted
Thyroid Disorders	3 of 94 mothers experienced hypothyroidism, 31.9% of children with high TSH, the highest was in very short children	71 grade 0 and 1 goiters had grade 1 goiter	18.5% (563) had a grade I goiter, and 5.5% (167) had a grade II goiter giving a total goiter rate (TGR) of 24.0% (95% CI: 22.5-25.5%).	Mild IDD (18%), moderate IDD (2%) and Severe IDD (1%). The rest (51%) of respondents have sufficient iodine and (28%) of respondents are at risk of developing hypothyroidism	Hypothyroidism as many as 16 children (33%),
Thyroid relationship with stunting	Hypothyroidism in the mother correlates with very short stature in the child	Iodine deficiency is one of the causes of stunting	Children who have a goiter has strongly associated with stunting	The use of iodized salt has nothing to do with stunting	Children with high pesticide exposure have more than three times the risk of experiencing stunting

From the results of the article review, stunting occurs in children who are exposed to pesticides from an early age, related to the etiology of stunting. Based on the etiology, stunting can be divided into two categories, namely GH deficiency and idiopathic.^{3,53} Children born and raised in agricultural areas are potentially exposed to pesticides from the time they are in the womb, so they are at risk of various diseases, health problems including growth disorders. Pesticide exposure can cause growth abnormalities through a variety of methods, such as a disturbance of the hormone system that affects how quickly things develop. Endocrine disrupting chemicals (EDCs), which are chemicals in the environment that can interfere with the synthesis, secretion, transportation, metabolism, binding work, and elimination of hormones in the body that maintain homeostasis, reproduction, and the process of growth and development, include several types of pesticides, including organophosphates and carbamates, which are widely used in agricultural activities. IGF-1 and thyroid hormone are two hormones essential for a child's growth and development. Several studies have shown that pesticide exposure is a risk factor for hypothyroidism. Thyroid hormone deficiency (hypothyroidism) will cause metabolic disorders resulting in impaired growth and development. Thyroid dysfunction caused by pesticide exposure works through several mechanisms that interfere with the TSH receptor on the thyroid gland, due to the similarity of the chemical structure of the pesticide to thyroid hormone, causing a decrease in the activity of the D1 enzyme (deiodinase type 1), and stimulating the D3 enzyme. Exposure to pesticides, especially organochlorines, can also interfere with IGF-1 function [8].

4 Conclusion

This literature review shows that thyroid disorders are one of the factors associated with stunting in children. Children with thyroid disorders, both in the womb and after birth, experience several congenital anomalies after birth and growth hormone deficiency. Decreased thyroid hormone function causes a decrease in the secretion of growth hormones, such as Growth Hormone (GH), Thyroid Stimulating Hormone (TSH), Luteinizing hormone (LH), and Adrenocorticotropic Hormone (ACTH), which play a role in the secretion of Insulin Growth Factor-1 (IGF-1). This triggers constitutional growth delays or nutritional status disorders, which in the end children experience stunting. From this literature review, it is hoped that the public can find out and prevent thyroid disorders in pregnant women and children, so as to reduce the risk of stunting.

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