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## Diabetes duration and thyroid stimulating hormone levels in children with type 1 diabetes mellitus

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### Abstract

**Background** Children with type 1 diabetes mellitus (T1DM) are at risk of thyroid dysfunction. An association between diabetes duration and thyroid stimulating hormone level remains inconclusive.

**Objective** To assess for a possible association between diabetes duration and thyroid stimulating hormone levels in children with T1DM.

**Methods** We conducted a cross-sectional study from January to June 2017 in the Pediatric Endocrine Outpatient Clinic at Dr. Soetomo Hospital. Subjects were children with T1DM aged 7 to <18 years. Exclusion criteria were children with diabetic ketoacidosis, previously diagnosed thyroid problems, and hospitalization in the pediatric intensive care unit (PICU).

**Results** From the 55 regular patients in our outpatient clinic, 34 patients were included in the study. Nineteen (54.3%) subjects were male, and the overall mean age was 11.3 years. Subjects' mean duration of diabetes was 3 years and their mean thyroid stimulating hormone concentration was 3.76 mIU/L. Pearson's correlation test revealed no significant association between duration of diabetes and thyroid stimulating hormone level ( $r_s = -0.068$ ;  $P = 0.703$ ).

**Conclusion** There is no significant association between duration of diabetes and thyroid stimulating hormone levels in children with T1DM. [Paediatr Indones. 2018;58:80-3; doi: <http://dx.doi.org/10.14238/pi58.1.2018.80-3>].

**Keywords:** diabetes duration; thyroid stimulating hormone; type 1 diabetes mellitus children

According to the World Health Organization (WHO) and the International Diabetes Federation (IDF), the prevalence of diabetes is on the rise.<sup>1,2</sup> Data from the Pediatric Endocrine Working Group, Indonesian Pediatric Society, showed that 1,153 patients suffered from T1DM until April 2016.<sup>3</sup> Thyroid dysfunction is reportedly higher among T1DM patients.<sup>4-9</sup> Among diabetic adult populations, 15-30% reported autoimmune thyroiditis compared to 5-22% in children.<sup>8</sup> In the non-diabetic population, 2-10% adults and 1-4% children reportedly have the condition.<sup>10,11</sup> To date, serum thyroid stimulating hormone levels in T1DM patients have rarely been studied in Indonesia. Therefore, the objective of this study was to assess for a possible association between diabetes duration and thyroid stimulating hormone concentration in children with type 1 diabetes mellitus.

### Methods

This cross-sectional study was carried out from January to June 2017 in the Pediatric Endocrine Outpatient

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Clinic (OPC) at Dr Soetomo Hospital, Surabaya, East Java. Subjects were children with T1DM aged 7 to <18 years. Exclusion criteria were diabetic ketoacidosis, previously diagnosed thyroid problems, and hospitalization in the PICU. Blood specimens were processed by an ADVIA Centaur immunoassay system, using an electrochemiluminescence immunoassay (ECLIA) method to measure TSH levels. Statistical analysis was done with Pearson's correlation test. Results with P values <0.05 were considered to be statistically significant. FT4 levels were obtained for subjects with abnormal TSH levels.

**Table 1.** Baseline characteristics of subjects

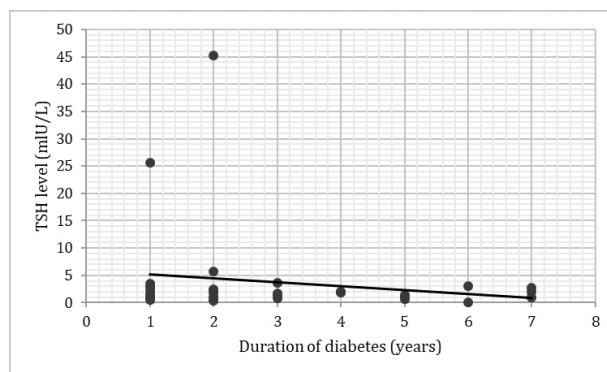
| Characteristics                                | (N=34)        |
|--|---------------|
| Male sex, n (%)                                | 19 (55.9)     |
| Mean body weight (SD), kg                      | 33.34 (12.6)  |
| Mean height (SD), cm                           | 136.6 (16.63) |
| Mean body mass index (SD), Z-score             | -0.68 (1.58)  |
| Mean age (SD), years                           | 11.3 (3.5)    |
| Mean duration of diabetes mellitus (SD), years | 3 (1.98)      |
| Mean TSH (SD), mIU/L                           | 3.76 (8.48)   |

The normal limits for FT4 were 1.0-2.1 ng/dL in 2 to 7-year-olds and 0.8-1.9 ng/dL in 8 to 20-year-olds. The normal TSH limits were 0.7-5.7 mIU/L in 2 to 7-year-olds and 0.7-5.7 mIU/L in 8 to 20-year-olds. The diagnosis of primary hypothyroidism was made in those with low FT4 and high TSH. Subclinical hypothyroidism was diagnosed in those with high TSH and normal FT4; hyperthyroidism in those with low TSH and high T3 and T4; and subclinical hyperthyroidism in those with normal TSH and high T3 and T4.<sup>12</sup>

## Results

There were 55 T1DM patients who regularly visited our OPC. Thirty-four patients met the inclusion criteria and were included in the study.

There were 2 male patients with high TSH levels, 25 and 45 mIU/L, respectively. These patients were subsequently found to have normal FT4 levels, hence, they were diagnosed with subclinical hypothyroidism. Mean TSH was 3.76 (SD 8.48) mIU/L, ranging from



**Figure 1.** Association between duration of diabetes and TSH levels in children with T1DM

0.033 to 45 mIU/L. Pearson's correlation test revealed no significant association between duration of diabetes and thyroid stimulating hormone concentration ( $r_s = -0.068$ ;  $P = 0.703$ ).

There were 2 patients with high TSH, one with duration of illness 1 year with TSH 25 mIU/L and one patient 2 years 45 mIU/L (Figure 1).

## Discussion

The mean TSH concentration in our subjects was 3.76 (SD 8.48) mIU/L. The International Society for Pediatrics and Adolescent Diabetes Mellitus recommends that screening of thyroid function by measuring thyroid stimulating hormone (TSH) and anti-thyroid peroxidase antibodies at the time of diabetes diagnosis and, thereafter, every second year in asymptomatic individuals without goiter, or in the absence of thyroid autoantibodies. More frequent assessment is indicated otherwise.<sup>13</sup> Kabelitz *et al.* and Loviselli *et al.* reported the prevalence of autoimmune thyroiditis in population was 2.9-3.4%,<sup>14,15</sup> while Kalaoumenou *et al.* reported 4.6% in Greek population.<sup>16</sup> Subclinical hypothyroidism was found in 7-20%<sup>5,7</sup> compared to adults with rates of 1-10%,<sup>7,8</sup> and 2-6% in the general population of children.<sup>9</sup>

In our study, subjects' mean duration of diabetes was 3 years and mean age was 11.3 years, in which in the periode of puberty. Thyroid dysfunction apparent at diabetes onset<sup>10,12</sup> or years thereafter.<sup>10,14,15</sup> Peak of autoimmune thyroiditis incidence in the early until mid puberty.<sup>17,18</sup>

Two of our male patients were diagnosed with

subclinical hypothyroidism. Females have been reported to be at risk for autoimmune thyroiditis.<sup>19,20</sup> Sharifi *et al.* and Araujo *et al.* stated that gender predisposition of patients suffered from thyroid dysfunction was varied.<sup>20,21</sup> Subclinical hypothyroidism is frequently observed in T1DM.<sup>13,21-27</sup>

We found no significant association between duration of diabetes and TSH levels in children with T1DM. Past studies have shown that the longer the duration of diabetes, the higher the prevalence of autoimmune thyroiditis.<sup>22--26</sup> A previous study reported that prevalence of autoimmune thyroiditis in T1DM patients increased post-puberty.<sup>25</sup> Another study stated that the peak prevalence of thyroid antibody was observed after the age of 15 years or a duration of diabetes of 3.5 years.<sup>26</sup>

Thyroid stimulating hormone is a sensitive method to detect thyroid dysfunction. Normal TSH has a high negative predictive value to exclude thyroid disease and TSH changes can be detected earlier than FT4 changes. Ramasamy *et al.* stated that TSH >2.2 mIU/L was predictor of hypothyroidism in T1DM, with 83% sensitivity and 72% specificity.<sup>28</sup> However, TSH is of limited value for diagnosing hypothyroidism in central hypothyroidism and acute illness. The TSH needs to be rechecked after the acute illness to distinguish between non-thyroidal illness syndrome and actual hypothyroidism.<sup>29</sup> In addition, the TSH examination is less expensive than the thyroid antibody test. Screening once every 2 years is safe, effective, cost-efficient, as well as useful for avoiding the trauma of unnecessarily frequent blood sampling.<sup>13</sup>

In conclusion, there is no significant association between duration of diabetes and thyroid stimulating hormone in children with T1DM.

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### Conflict of Interest

None declared.

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