

Maternal Cigarette Smoking and Maternofetal Thyroid Dysfunctions



Ahmed RG*

Zoology Department, Beni-Suef University, Egypt

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***Corresponding author:** Ahmed RG, Division of Anatomy and Embryology, Zoology Department, Faculty of Science, Beni-Suef University, Beni-Suef, Egypt, Tel/Fax: 002-010-91471828; Email: ahmedragab08@gmail.com

Introduction

Optimum levels in the gestational thyroid hormones (THs; 3,5,3'-Triiodothyronine (T3) and Thyroxin (T4)) are important for a regular pregnancy outcome [1-78]. Modulation of maternal thyroid function throughout pregnancy depends on several factors such as TH binding proteins, placental deiodinases, placental human chorionic gonadotropin, and dietary iodine [79,80]. Cigarette smoke comprises >4800 compounds, including at least 200 endocrine disruptors or toxicants and 80 recognized carcinogens [81,82]. As well, cigarette tobacco smoke is classified as human carcinogen according to the International Agency for Research on Cancer [82-84]. On the other hand, there are associations between the cigarette tobacco smoke and thyroid disorders. Cigarette smoking can increase the risk of multinodular goiter and Graves' orbitopathy in the iodine-deficient region [85-94]. In addition, exposure to cigarette tobacco decreases the levels of serum Thyroid-Stimulating Hormone (TSH) [67,68,72,85,89] and increases or decreases the levels of serum T4 and T3 [67,69,70,87,90,92,94-96]. In fact, the reduction in the levels of T3 and T4 was observed in both active and passive smokers [82]. On the other hand, the action of cigarette smoking on Thyroperoxidase Antibodies (TPO-Abs), Thyroglobulin Antibodies (Tg-Abs), and TSH Receptor Antibodies (TSHR-Abs) is debated. Some investigations have shown that cigarette smoking causes a reduction in the concentration of TPO-Abs and Tg-Abs [68,95]. Effraimidis et al. [75] reported that smoking cessation can increase the concentration of TPO-Abs and Tg-Abs. However, Pedersen et al. [81] stated a negative relation between the cigarette smoking and the presence of Tg-Abs in a moderate and mild iodine-deficient population. Moreover, Cho et al. [72] failed to find a link between the cigarette smoking and the concentration of TPO-Abs. Alternatively, Quadbeck et al. [93] postulated that the cigarette smoking increases the risk of the presence of TSHR-Abs.

During the third trimester, Shields et al. [80] reported that exposure to cigarette smoking decreases the concentration of maternal TSH and increases the concentration of maternal free T3. Also, smoking before gestation or during the first

trimester increases the concentration of free T3 and decreases the concentration of free T4, Tg-Abs, and TPO-Abs [88]. These disorders can increase the risk of hypothyroidism in the future. Smoking during the 2nd trimester increases the concentration of free T3, but the concentration of free T4 remains unchanged [88,94]. The conflicting results are possibly due to differences in sample size, study design, and definitions of cigarette smoke exposure [86,94]. There are numerous probable mechanisms by which smoking disrupts THs levels [80].

- Nicotine may induce the secretion of THs either directly or through sympathetic activation [73].
- Thiocyanate (a toxin in the cigarette smoke) may deplete the intrathyroidal iodine to elevate thyroid nodularity and autonomous THs secretion [85].
- Smoking may alter the activity of deiodinases and then THs levels [80]. Thus, it is also worth remarking that smoking during or before pregnancy may perturb the maternofetal thyroid functions.

This maternal disruption may increase the risk of mortality, morbidity, and several developmental disorders. Further studies are required to investigate whether the variations in the maternofetal thyroid function related to maternal active and passive smoke causes any adverse gestational consequences.

Conflict of Interest

The author declares that no competing financial interests exist.

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