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AEROBIC PHYSICAL EXERCISE AND PROLACTIN LEVELS IN BLOOD DURING BREASTFEEDING IN WOMAN WITH HASHIMOTO’S THYROIDITIS - A CASE REPORT

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Abstract
Introduction. The World Health Organization (WHO) recommends exclusive breastfeeding for the first six months of life. Many factors affect milk production. Physical exercise can significantly affect prolactin secretion in the blood. Case report. A respondent in this study is a primipara (33 years old) diagnosed with Hashimoto's thyroiditis and a singleton pregnancy. During pregnancy and after the childbirth, she has continued with light to moderate physical exercise. During the first six months after the childbirth, the following variables were observed: body morphological status, running volume and the level of prolactin in the blood. Conclusion. In this case study, light to moderate intensity aerobic exercise, had no negative impact on the level of prolactin in the blood during the first six months after the childbirth in an individual with Hashimoto's thyroiditis.

Key words: physical exercise, prolactin, breastfeeding

Apstrakt

Ključne reči: fizičko vežbanje, prolaktin, dojenje
Introduction

Breastfeeding is considered the most optimal nutrition of the newborn in the first months of its life (1). The two major world organizations (WHO and UNICEF) exclusively recommend breastfeeding during the first six months of the child's life, and possibly longer (2, 3, 1).

Due to insufficient information about the importance of natural nutrition, many women stop breast-feeding much earlier and switch to the artificial nutrition of their newborns (1). In the world, the number of exclusively breastfeeding children up to the age of six is 38%, while in Serbia this number was only 13.7% in 2010 (2, 3, 1).

Many factors have an effect on the secretion of breast milk. The main reasons why a mother can get into a state of losing milk are sudden weight loss, irregular diet, stress, or exposing to great physical effort (4, 5, 6, 7). Due to the justified fear of losing milk, many women give up recreational exercise after delivery (3, 8). However, the ability to breastfeed primarily depends on the health status of the woman. Maintaining proper lactation is significantly influenced by the functioning of the thyroid gland (9). Any thyroid disorder may have a negative impact on breastfeeding, especially if the woman is exposed to a high physical burden (9). In addition, increased physical effort can lead to thyroid hormone disorder (10, 11).

Earlier studies were less concerned with the impact of high intensity exercise on the possibility of successful breastfeeding in women athletes or in women with some chronic illness (12, 9, 6). Some studies point out that high intensity exercise did not have a negative impact on breastfeeding (13, 12). It is assumed that the examined women compensated for increased energy consumption due to exercises with higher intake of nutrients, thus excluding the possibility of loss of lactation. Besides, these studies point out that the research was performed on a small number of women who were previously physically active, so the results cannot relate to the general population (13).

Although it is known that the ability to breastfeed is very important, as well as the number of feedings per day, it is very important that a woman who exercises after a delivery does that in a proper and safe manner (11, 6, 7, 14). In this case study, a six-month physical exercise of a woman who has recently given birth was monitored. The significance of the
study is reflected in the continuous moderate intensity aerobic exercise that continued after delivery, as well as the effect of exercise on lactation in subjects with diagnosed thyroid disorder.

Due to insufficiently studied impact of exercise training during the breastfeeding period, in some women, there is fear of an early loss of milk (5, 15). Additionally, there are even less number of studies on the impact of high-intensity exercise in female athletes or women with certain chronic disease (13,12,9).

**Case report**

A respondent is a female athlete (33 years old) diagnosed with Hashimoto's thyroiditis and a singleton pregnancy. The morphological parameters: height 176 cm, body weight: 58,7 kg (before the pregnancy), 68,7 kg (before delivery) and 62,9 kg (after delivery). She recreationally competed in triathlon and marathon for many years. During pregnancy and after the childbirth, she has continued with light- to moderate-intensity running. Hormone therapy in pregnancy was increased from 25 mg to 50 mg of levothyroxine sodium (Tivoral®). The research covered the period of six months after the childbirth. Before pregnancy and a week after the childbirth, changes in physical morphological status were observed (Table 1). Volume of training were recorded on a daily basis (Figure 1). Analysis of the morphological status was performed at the end of every month during the study period, as well as the test of prolactin levels in the blood (Table 1). Two weeks after the childbirth, she started running. The number of trainings (3-7 times per week) depended on: leisure time, care of the newborn, housework and other obligations. The volume of training was (5 km, 7km or 10 km per day) controlled by fitness monitor (Garmin Forerunner 310 XT). Regular checks of hormones (prolactin and thyroid hormones) and other parameters of blood (iron, glucose, cortisol, leukocytes and feremia) were carried out in laboratory conditions. During the research covered (2nd to 5th month), the respondent reported health problems with symptoms: dry skin, itchy elbows, as well as the whole body itching that was more intense at night. During this period, there was a feeling of “empty breast” and lower
secretion of milk. In the analysis of the health condition, tests showed negative results to: Candida, parasites in the stool and Helicobacter Pylori (IgA and IgG). Ultrasound of the upper abdomen showed no pathological changes in internal organs. A blood test showed: optimal values of serum iron 10.6 (6.6 to 26.0 umol/l), glucose 4.2 (4.1-6.1 mmol/l) and evening cortisol 122.30 (64-327 nmol/l), low values of leukocytes 3.5 (4.0-10.0 10E9/L) and high values of morning cortisol 837.9 (171-536 nmol/l). This blood variables were measured by calorimetric method. Low TSH level was measured (Table 2). Pruritus was diagnosed but therapy treatment was not determined. During this period, the respondent continued with the usual training.

Without specific therapy treatment, itching did not disappear. With a sudden loss of weight (7.9 kg), the following symptoms appeared: a sense of cardiac palpitations (observed: ta: 110/60 mmHg, p: 80 min), a common nervousness, headache, insomnia and increased hunger. Ultrasonography of the thyroid gland showed normal shape and size of the thyroid gland, of slightly inhomogeneous echotexture, mediocre CD signal, without focal changes, dimensions: DR: 13×16×47 mm, LR: 14×15×46 mm. Hyperthyroidism was diagnosed. Hormone therapy was reduced to 25 mg (Euthyrox). By applying a certain treatment after 3-4 weeks there have been the following changes: increased appetite, weight gain, feeling of abdominal fullness and bloating. Hormone therapy was increased to 50 mg (Euthyrox). After 10 days, the itching disappeared completely.

During the study period, the respondent exclusively breastfed. In the period of six months, a menstrual cycle was not established. The respondent did not change diet during pregnancy, as well as after the childbirth, except in the low milk supply. In the days of so-called “lactation crisis” (the fourth month after pregnancy), the respondent continued running, but with the reduced scope and at a lower intensity. After a while, she completely stopped running for a period of two weeks. During the period of complete rest, she increased fluid intake (about 2 l) and the caloric value of the food in the course of the day. The respondent pointed out that, during the period of relactation, she rested with the baby during the day. The number of breastfeeding was increased to about 10-12 times during 24 hours. When necessary, she used a manual breast pump.

During this period of six months after the childbirth, decline in the value of the hormone prolactin below the lower reference value has not been recorded (Figure 2). After the re-
establishment of sufficient quantities of milk for breastfeeding, the respondent increased training volume and continued with regular light- to moderate-intensity running. Growth and development of the child was monitored through regular medical checks. The smallest increase in the baby's body weight was noted in the period of the mother’s health problem (the third and fourth month after the birth). During the period of six months, the baby doubled its body weight at birth (3060 g - 7000 g) and grew 16 cm (48 cm - 64 cm).

Discussion
For the physically active women with a thyroid disorder to breastfeed successfully, it is necessary to control the thyroid hormones regularly, as well as to adapt the hormone therapy to the needs of the body (9). Increased physical activity can cause a disorder of thyroid hormones (10, 11). In addition, due to the increased energy consumption, it is essential to stay nourished and hydrated properly (13,14). Studies have shown that continuous moderate aerobic exercise has no adverse effects on the quantity and composition of breast milk, but a certain amount of lactic acid was confirmed which may be a cause of sour flavor and rejection of baby breastfeeding (16,17). Some studies show that there was no significant difference in the nutritional value of milk among physically active and sedentary women (13,4,6,8).

Besides, studies that tracked changes in the level of prolactin in the blood in physically active women have shown that moderate aerobic exercise has no harmful effects on the secretion of this important hormone responsible for successful lactation (13,4,5,15). Disrupting secretion of breast milk may be caused by rapid weight loss due to malnutrition or increased physical effort and stress (4,5,6,7). During pregnancy, prolactin level in the blood of a pregnant woman gradually increases and reaches the maximum value just before giving birth, while this value decreases after the established lactation (11,18).

In this case study, although prolactin levels were above the upper limit of the reference value during the study period of six months, short-term loss of milk probably can be considered the cause of the changes in the thyroid gland, as well as unadjusted training activities (13,15,12,9,6).

Changing hormone therapy, increased caloric intake and proper hydration had a positive impact on overcoming minor problems related to breastfeeding (5,9,14). Sudden weight
loss had no negative impact on the level of prolactin in the blood. Although some studies note that production of breast milk largely depends on the mother’s level of nourishment/BMI, the above mentioned case can be considered a situation where the body reacts to protect lactation in women with a small percentage of fat in the body (13,15,6). With the increased physical activity and energy deficit, the body responds in the form of increase of the hormone responsible for the maintenance of lactation (15). Some elite female athletes doing aerobic sports state that despite minor problems they successfully breastfed (13,12). Although the impact of frequent breastfeeding on the level of prolactin in the blood has not been fully confirmed, it is considered that the number of breastfeeds during the day can have a significant impact on milk production (13,4).

While increased physical activity has a positive effect on weight loss after childbirth, gradual weight loss will not have a negative impact on the level of prolactin in the blood during lactation (4,6). It is very important to continue with the controlled and proper exercise during pregnancy and after delivery (11,14). Reduced cortisol and glucose levels in the blood during the lactation period are expected (7). Regular blood analysis showed normal levels of blood glucose, reduced values of leukocytes and increased values of the morning cortisol.

Conclusion
The study where the case of breastfeeding during the first six months after the childbirth was observed has not shown negative effects of aerobic exercise training on prolactin levels in the respondent with Hashimoto's thyroiditis. The measured prolactin levels ranged above reference values and, despite short-term problems with lactation there has not been a complete cessation of breastfeeding. With the adjusted nutrition, enough rest and principles of exclusive breastfeeding of the baby “on demand” there has been a re-establishment of successful lactation.

Acknowledgement
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References


Table 1  Morphological status and prolactin values in blood of respondents measured during pregnancy and postpartum

<table>
<thead>
<tr>
<th>Measurement during pregnancy</th>
<th>Period measurement</th>
<th>body weight (kg)</th>
<th>BMI (kg/m²)</th>
<th>Body fat (%)</th>
<th>Prolactin (102-496 µU/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40th week of pregnancy</td>
<td>68.7</td>
<td>22.3</td>
<td>25.5</td>
<td>2798</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement after delivery</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
<td>62.9</td>
<td>20.5</td>
<td>20.3</td>
<td>4095</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>61</td>
<td>19.8</td>
<td>18.3</td>
<td>1130</td>
<td></td>
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<td>3</td>
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<td>16.2</td>
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<td>4</td>
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<tr>
<td>6</td>
<td>56.7</td>
<td>18.5</td>
<td>16.9</td>
<td>907.8</td>
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</tr>
</tbody>
</table>

* one week after delivery

1-6 - measurement at the end of the month during the study period

Table 2  Values of thyroid hormones measured by different laboratory methods during the first six months after delivery

<table>
<thead>
<tr>
<th>Thyroid hormones</th>
<th>Reference values 1</th>
<th>Reference values 2</th>
<th>Reference values 3</th>
<th>Reference values 4</th>
<th>Reference values 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSH</td>
<td>3,76 (0.27-4,20) mU/L</td>
<td>&lt; 0,01 (0.35-4,94) mU/L</td>
<td>12,67 (0,27-4,20) mU/L</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>T3</td>
<td>/</td>
<td>/</td>
<td>2,5 (1,0-2,7) nmol/L</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>T4</td>
<td>17,21 12-22 pmol/L</td>
<td>129 (60-160) nmol/L</td>
<td>/</td>
<td>/</td>
<td>9,1 (9,1-19,1) pmol/L</td>
</tr>
</tbody>
</table>

* 1 - 4 number of measuring
Figure 1. Mean values and standard deviation of the monthly volume of training during the first six months after delivery.