

# Exercise training effects on sex hormone and inflammatory responses in asthmatic women

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Asthma is a chronic airway disorder that affects approximately 300 million people worldwide, and its prevalence is steadily increasing [1]. Gender differences in asthma incidence, prevalence and severity have been reported worldwide. After puberty, asthma becomes more prevalent, suggesting a role for sex hormones in asthma genesis [2]. There is evidence suggesting the relationship between sex hormones and inflammatory responses in asthma [3]. Estrogens can have potential effects on each step of allergic sensitization: antigen presentation, type 2 T helper cells (Th2) polarization, isotype switching to immunoglobulin E (IgE), and mast cell degranulation via classical estrogen receptors [4]. Increase in exhaled nitric oxide levels and stimulation of Th2-mediated inflammatory responses by progesterone has been considered by many studies [3]. It is hypothesized that hormonal status, specifically the estrogens' fluctuations at ovulation and before periods may influence asthma in women. According to this, asthma can deteriorate during the preovulatory and perimenstrual period (PMA) [5]. Using hormonal contraception is one of the preventive strategies at reducing the cycle-related inflammatory worsening of asthma by reducing estrogens' fluctuations [5]. But some results in the effect of hormonal contraception and HRT, associated with increased risk of developing breast cancer [6]. Exercise as a non-medical and healthful factor is an effective way for lower estrogen and progesterone levels and estrogens' fluctuations during the menstrual cycle. Several studies suggest value in regular exercise interventions to reduce estrogens' hormone levels in women [7,8]. Previous articles provided us that testosterone is an immunosuppressant and is likely to be protective against immunological and inflammatory processes that trigger asthma. This may be one reason why men are less likely to develop asthma [9]. Several studies have reported elevated resting testosterone levels, following combined aerobic and strength training [10]. So it seems that the combined aerobic and strength training is beneficial in modifying sex hormones of asthmatic women. Exercise training may drive inflammation changes through sex hormone changes. Exercise role in reducing the inflammation and intensity of asthma, have attracted the attention of many researchers. In this regard, many researchers have extensively studied the effect of exercise therapy alongside other drug treatments on asthma and some studies have pointed up the positive effects of aerobic exercise training in reducing the inflammatory markers in asthmatic patients [11,12]. There are a few studies on the

effect of exercise training on inflammatory mediators with controlling the menstrual cycle and sex hormone levels in women with asthma. So we suggest that further studies that highlight the effect of combined aerobic and strength training on estrogens' fluctuations and female sex hormones and inflammation changes in asthmatic women should be conducted.

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