

**Original Review Article**

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HORMONE IMBALANCE—A CAUSE FOR CONCERN IN WOMEN**J K Roop***

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ABSTRACT: Hormones are chemical messengers secreted by endocrine glands of the body that regulate various metabolic functions and reproductive performance of an individual. Hormone imbalance, too much or too little, may cause serious effects throughout the body. Normally, natural aging results in minor fluctuations in the hormone levels. To meet the needs of an ever increasing human population it becomes necessary to employ various means to increase livestock, dairy, poultry and agricultural produce. This has promoted the use of pesticides, insecticides, herbicides, rodenticides and many other chemical substances that have contributed to environmental contamination. Environmental contamination affects the overall health of an individual. Another major challenge is unemployment and excessive competition to earn livelihood. This has made man more intolerant and vulnerable to stress that forced him to change life style and dietary habits. These changes cause major fluctuations in hormone levels leading to hormone imbalance accompanied with various diseases and disorders. Women are more prone to these disturbances as compared to men. Sometimes medication may lead to disruption in hormone levels. The present study deals with some of the symptoms and signs associated with hormone imbalance that if unnoticed may lead to shortening of life span. It is highly recommended to take the advice of health practitioner to improve the lifestyle and dietary habits.

KEYWORDS: Hormones, Metabolism, Stress, Hormonal imbalance, Disorders

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1. INTRODUCTION

Hormones are chemical messengers or compounds produced by various endocrine glands of the body that are required to maintain various metabolic processes in the body. Without hormones a child cannot grow, women cannot get pregnant, one cannot sleep and fight stress. Imbalance in the secretion of hormones may lead to many problems that make life terrible. Hormone imbalance may be considered as a silent killer and is emerging as a true epidemic not only in India but throughout the world. In today's fast growing society, privatization, modernization, globalization, intensive advancement in agriculture, overpopulation and unemployment has made man more vulnerable to irritability, stress, restlessness, mood swings, anger, depression, intolerance and abruptness in behavior. All these symptoms have contributed to hormone imbalance. These effects increase as one ages and become more pronounced and difficult to treat. Moreover, Studies have been conducted on rats and humans to indicate that environmental contamination due to pollution has devastating effects on the overall health of an individual at all most all the ages by causing hormone disruptions and various disorders [1-4]. Women are more prone to such imbalances as compared to men. Variations in hormone secretion becomes prominent during menstruation, pregnancy and menopause. Sometimes medication taken to treat one type of a disease may cause disturbance and interfere in the production and secretion of hormones. The objective of the present study is to analyze symptoms and signs associated with hormone imbalance in women. There are many risk factors for- and symptoms of hormone imbalance in women [5]. Increased free estrogen levels (hyperestrogenism) in women have led to early menarche, eating disorders, premenstrual syndrome, endometriosis, uterine fibroids, menstrual disturbances/ difficulties such as muscular cramps, pain and heavy bleeding, infertility and breast cancer [6-9]. Some of the causes that lead to hyperestrogenism are- changes in dietary habits that include heavy intake of food leading to obesity and increased conversion of testosterone to estrogens in the presence of enzyme aromatase. It may be attributed to hyperinsulinism that is characterized by dysregulated insulin secretion which result in mild to severe hypoglycaemia [10]. It increases the production of ovarian testosterone and reduces sex hormone-binding globulins, thereby increasing free estrogen levels in the blood [11, 12]. Therefore, diet greatly modulates estrogen synthesis, metabolism and its receptor activity [13]. Consumption of alcohol interferes with detoxification of estrogen in the liver and increase the estradiol levels in the blood. The increased levels of estradiol can cause breast cancer [9, 14, 15]. Environmental toxins or chemicals are considered to be the major sources of exogenous estrogen (xenoestrogen) exposure. These can be phytoestrogens (plant derived estrogens), mycoestrogens (fungi derived estrogens) and mycotoxins. Many xenoestrogenic industrial synthetic compounds include Phthalates, PCB (polychlorinated biphenyl) and BPA (bisphenol A) [16-21]. The presence of an estrogenic substance in the dairy products and food is the major health concern for an individual as well as for the whole population [13]. The xenoestrogenic compounds find their way

into our food supply through pesticides and herbicides. Hormones that are used to increase the milk production and livestock also increase the human susceptibility to environmental estrogens [17], [22-24]. Antibiotics found in food supply may also be associated with the risk of breast cancer by altering gut flora involved in enterohepatic circulation of estrogens [25]. Hormone imbalance due to various factors affect multiple aspects of life. Some of the most challenging aspects have been discussed here.

Hormone imbalance, stress and sleep

Sleep and rest are necessary and form an integral part of healthy, prosperous and joyful life. Sleep focus on repairing and revitalizing mechanisms of the body. Therefore lack of sleep may interfere with various metabolic processes. Once the disturbance is initiated it becomes more pronounced with time and age. It is difficult to say whether lack of sleep cause hormone imbalance or hormone imbalance cause lack of sleep or insomnia. Sleep problems are much more likely to be reported by women, as normally, in most of the life stages women slept more than men [26]. They suffer insomnia twice the rate of men. Hormone estrogen is directly linked to sleep [27]. Any fluctuation or decrease in estrogen due to physical stress like over exercising, low fat or low carbohydrate diets, undereating/fasting and dramatic weight loss may lead to anxiety, restlessness and sleep disturbance [27]. Disturbed sleep affects fertility by altering ovulation pattern. Leptin, an adipocyte derived hormone is known to be associated with sleep and fertility [28-30]. It suppresses appetite [31]. Normal sleep is required to produce adequate amounts of leptin. Decreased sleep duration decrease the amount of leptin produced and increase the levels of ghrelin [29]. Ghrelin is a potent stimulator of appetite and is produced by specialized cells of stomach and pancreas [32-34]. Leptin acts on central nervous system to suppress the food intake and increase the energy consumption [35]. Leptin deficiency increases appetite and leads to obesity [36, 37]. It has also been reported that elevated leptin concentrations decrease appetite and slow down the basal metabolism that is associated with obesity. This may explain the negative impact of leptin on fertility [38-40]. Significant serum hyperleptinemia have been reported to cause female infertility [40]. Leptin regulates ovarian folliculogenesis indirectly through regulating the levels of LH (Luteinizing Hormone) and FSH (Follicle Stimulating Hormone). There is moderate inverse association between leptin, time of LH Surge and ovulation [30]. So, if sleep is disturbed, leptin levels affects ovulation and this may cause irregular menstrual cycles and decrease in fertility i.e., difficulty in conceiving [30]. Women who are night shift workers are known to have disrupted menstrual cycles and have difficulty in maintaining regular sleep patterns. Irregular light-dark periods affects the levels of hormone melatonin produced in the shift workers [41]. Sleeplessness may cause irritability and stress. Anti-depressants are prescribed to relieve stress [42]. Living in stress cause loss of progesterone [43]. During peri-menopause period, progesterone levels begin to fall, especially when women are stressed [44]. Both age and stress decrease the amount of progesterone produced by the ovaries [44].

Excessive intake of sugar, saturated fat and deficiencies of vit. A, vit.C, vit. B₆, vit.D₃ and zinc are also known to reduce progesterone levels [45-49]. This creates imbalance between progesterone and estrogen and due to this women may experience vaginal dryness, urinary infection, joint pain and weight gain [27]. All these may lead to sleep disturbance. Mild hypothyroidism is also associated with decreased progesterone production and sleep difficulties [50-57]. Hypothyroidism may occur due to stress and various environmental chemicals. Moreover prolonged and chronic stress causes elevated levels of cortisol and adrenalin from adrenal gland situated on the kidneys that suppresses the immune system and cause sleeplessness in women [28, 44].

Hormone imbalance and precocious puberty

Puberty is the period of transition from childhood to adolescence and attainment of adult reproductive ability by the age of 12-15 years [58-60]. It is considered precocious if it occurs by the age of 8-9 years [58, 61, 62]. It is associated with increased exposure to environmental estrogens that have been reported to cause hormone imbalance in the body [59].

Hormone imbalance and memory

It has been well documented that estrogen affects the brain and memory [63]. It increases the blood flow and supply of glucose and oxygen to the neurons. Persons who do not eat enough carbohydrates lack memory. Food rich in simple carbohydrates are associated with negative mood [64]. Estrogens have been known to possess neuroprotective and neurotrophic effects. They increase the neurotransmitter levels and help to increase body's sensitivity to nerve growth factor and decrease the neuronal production of Alzheimer linked beta-amyloid peptides [43, 65]. Research suggested that changes in estrogen levels during normal aging may increase the risk for Alzheimer disease (a type of dementia) [66, 67]. Normal concentrations of estrogen lowers the risk of developing Alzheimer's disease, although it did not appear to slow or reverse the course of disease once symptoms appear. Those women who were put on estrogen supplements during or shortly after menopause were less likely to develop Alzheimer's disease than those women who had not been on such therapy [66]. Prolonged increase in glucocorticoids (cortisol) that occur during the periods of stress, aging and other traumatic conditions have been associated with impairment and loss of memory [68].

Hormone disturbance, weight gain and weight loss

Thyroid hormones are known to regulate basal metabolic rate of the body. Any decrease (hypothyroidism) or increase (hyperthyroidism) in the levels of their secretion may cause many physiological changes. Hypothyroidism cause weight gain, depression, hair loss, low energy, constipation, dry skin and cold intolerance. Hyperthyroidism causes weight loss, warm body all the time due to increased metabolism, high energy and diarrhea [69, 70]. Imbalance in cortisol levels also lead to weight gain. These are associated with estrogen dominance [71, 72]. Cortisol regulates glucose and insulin levels, inflammation, bone matrix deposition, muscle building, mood and mental

focus, stamina, sex drive and sleep cycles [73, 74]. When stress increases, cortisol levels fluctuate up and down and this triggers blood sugar and insulin imbalances, food cravings and inhibition of thyroid function. This cause decrease in metabolic activities and therefore weight gain [72, 75].

Hormone imbalance and insulin resistance (hyperinsulinemia)

Insulin secreted by pancreas regulate carbohydrate, protein and fat metabolism. It reduces blood glucose level shortly after blood meal. Good health depends upon the body's ability to make and use insulin in adequate amounts to keep blood sugar at optimal levels for effective metabolism. Any disturbance in insulin level becomes the cause of various disorders. When insulin signals are lost, the cells do not respond to insulin. This is known as insulin resistance. It results in rise in blood glucose levels and deposition of fat that leads to obesity and type II diabetes. Insulin resistance increase the amount of androgens that may lead to acne, infertility, facial hair growth and head hair loss, dark patches of skin on neck or skin tags [76]. It also causes polycystic ovarian syndrome (PCOS) [76, 77].

Hormone imbalance and polycystic ovarian syndrome (PCOS)

PCOS is an endocrine disorder that is supposed to be the common cause of menstrual disorders characterized by chronic anovulation, hyperandrogenism and infertility [76, 78]. Infertility and anovulation is reported in about 10% to 13% of all the women of child bearing age [76], [78-80]. Various metabolic disorders have also been reported due to PCOS [81]. Some women have polycystic ovaries while some may have single ovarian cyst. Insulin resistance is considered as the main cause of PCOS. As described earlier insulin resistance decrease the ability of the body to break down and absorb glucose. The ovaries are sensitive to insulin and when there is imbalance in insulin concentration, ovaries try to compensate it by producing more ovarian hormones and this leads to disturbance in various metabolic processes of the body [81]. It may lead to acne, infertility, facial hair growth and head hair loss, dark patches of skin on neck or skin tags [76, 77]. Other reported causes are increased testosterone levels and any mutation in Luteinizing Hormone and/or its receptor [77, 82, 83].

Hormone disturbance and digestive problems

Various reports indicate that fluctuations in the levels of estrogen and progesterone may lead to increase in gastrointestinal painful and non-painful symptoms as during the menstrual cycle and the perimenopause (early menopause) transition in women with or without Irritable bowel syndrome. Imbalance have been reported to be associated with headaches, bloating, weight gain, mild to severe crampings, backaches, cravings for salty or sweet food, sensitivity to temperature and allergic reactions [84-86].

Hormone imbalance and depression

It has been reported that estrogen is needed in adequate amounts to increase and maintain the levels of serotonin, a neurotransmitter that can prevent bloating, mood change, irritability, headaches and

depression [87, 88]. Decrease in estrogen levels may bring about decrease in serotonin concentration that can lead to depression, anxiety and sleeplessness [89, 90]. Estrogen administration is reported to increase the serotonin availability by decreasing serotonin breakdown and by altering mRNA and protein levels of various serotonin markers. These effects may have direct implications on female mood disorders such as premenstrual disorders and depression during pregnancy, postpartum, and during the menopausal transition [88, 91]. In response to specific physiological and pathological stimuli, progesterone and various other synthetic progestational agents modulates the synthesis and release of several neurotransmitters and neuropeptides [92, 93]. Progesterone affects GABA (gamma amino-butyric acid) receptors in the brain and make the body calm. It helps alleviate mood swings, irritability and depression [92, 93]. Therefore it can be stated that any disturbance in estrogen-progesterone ratio may alter mood and cause depression. Elevated cortisol levels can cause insomnia, depression, anxiety and difficulty in handling stress [73, 74]. Decrease in thyroid hormone also cause decreased metabolism and depression [71].

Hormone imbalance and hairs on the body (hirsutism)

Presence of terminal coarse hairs in females in a male like distribution pattern is known as hirsutism. It affects 5-10% of women around the world [94, 95]. Hirsutism may be attributed to either increased production or increased sensitivity of the hair follicles to androgens circulating in body. This may be due to metabolic disorders or environmental pollutants [96].

Hormone imbalance and allergy

Many reports indicate that allergies, auto-immune diseases and hypothyroidism are more common in women due to hormonal imbalance. The symptoms associated with hormone associated allergies are severe and may lead to pregnancy loss and impose great psychological and physical pressures [97-99].

Hormone imbalance, hysterectomy and osteoporosis

Due to environmental perturbations or changes in the dietary habits, problems associated with reproduction and reproductive tract have come into existence. Xenoestrogens in the diet may lead to estrogen dominance in the body that become the major cause of hypothyroidism [100, 101], fibroids and endometriosis [102-111] and breast cancer [112, 113]. Due to this, surgical removal of uterus (hysterectomy) or ovaries (ovariectomy) or both have led to sudden depression in the levels of estrogen, progesterone and testosterone. This may lead to decreased bone density causing osteoporosis, muscle mass, heart palpitations, stress and depression [71, 114].

2. CONCLUSION

Hormone balance is vital to healthy mind and body. Any disruption or fluctuation that may occur naturally, at puberty, perimenopause and menopause may cause many life threatening diseases and disorders in both, men and women. Aging is one of the natural factors that affect the balance of hormones in the body. Others factors are environmental toxins particularly xenoestrogens, fat diets,

refined foods, sugar rich foods, medications, lack of physical exercise, genetically modified foods and altered dairy and poultry foods. These are known to cause obesity, diseases and aggravate hormone variations and associated disorders in the form of PCOS, hypothyroidism, insulin resistance and diabetes, hypogonadism, memory loss, lack of concentration, depression, constipation, thinning of hairs on the head, thinning of skin, puffy eyes, stress, sleep disturbance and food cravings [115-117]. They can be corrected with modified and healthy diet. There is a need to cut down the use of pesticides, insecticides, herbicides and many other chemicals that are used to increase the productivity. Moderate exercise or brisk walking may regulate the cortisol levels and maintain glucose metabolism [118-123]. Cortisol have been reported to increase significantly when an individual is exposed to stress of various kinds. These may be physical, psychological, traumatic or inflammatory stresses [124]. Moreover hormone therapy is needed for treating hormone imbalance. Bioidentical hormone replacement therapy is used to balance hormones that have become dysregulated or deficient as a result of stressful lifestyle, environment and aging. Restoring the hormone levels can provide greater protection and prevention from various chronic diseases [125, 126]. So, it is highly recommended to take the advice of properly trained health consultant to maintain healthy lifestyle.

3. CONFLICT OF INTEREST

None

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