

Impact of Unbalanced Diet Causing Hormone Imbalance in the Middle-Aged Women

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Abstract

Hormones perform a crucial role in women's health. Variations in hormone levels (estrogen and progesterone) can negatively affect women's mood, sexual desire, ovulation process, and fertility. A balanced and healthy diet has a major influence on various hormonal processes and facets of our wellbeing. There are multiple factors related to diets, such as food sensitivity leading to allergic reactions, obesity, inflammation from inadequate diet and sedentary lifestyles, sleep habits, digestion, and others. All these factors contribute to hormonal imbalances and associated complications. Diet-derived circulating constituents can perform immediate and indirect actions for receptor activation, signalling, and supplying micronutrients.

Index Terms

Hormone Imbalance, Unbalanced Diet, Women.

INTRODUCTION

Hormones are essential compounds and chemical messengers that are formed by different endocrine glands of the body[1]. Hormones are vital for the maintenance of many metabolic processes within the body. Women cannot get pregnant without hormones. They are crucial for adequate sleep and combating stress. Without hormones, a child's development will be obstructed. Unbalance in hormone secretion can lead to many life-threatening problem[2] Hormone disequilibrium can be called a silent killer is emerging as a serious issue not only in India but worldwide. Factors such as modernization, globalization, rigorous development in agriculture, work stress, and unemployment have made people more susceptible to petulance, anxiety, restiveness, explosiveness, resentment, despair, and intolerance in behaviour[3]. The hormone imbalance has been impacted by all these factors.

Women are more likely than men to encounter such imbalances. During menstruation, pregnancy, and menopause phases, differences in hormone secretion are prevalent. Medicines taken to cure one form of the disease are often disruptive and interfere with hormone development and secretion[4]. There are several risk factors and symptoms associated with hormone imbalance in women. Women with increased free estrogen levels have shown to exhibit early menarche, dietary disorders, premenstrual syndrome, endometriosis, uterine fibroids, menstrual issues, such as pain with severe bleeding, breast cancer, and infertility[5].

Hyper estrogenic conditions occur because of factors that involve improvements in eating patterns, such as a high intake of food, resulting in obesity, and an improved transfer of testosterone to estrogens in the presence of aromatase enzymes[6]. Hyperinsulinism is exemplified by the

dysregulation of insulin secretion leading to moderate to extreme hypoglycaemia[7]. Hormone imbalance and its increased levels raise ovarian testosterone secretion and decrease sex hormone-binding globulins and raising the levels of free estrogens in the blood. Diet thus greatly regulates the synthesis of estrogen, metabolism, and the activity of its receptors. Alcohol use interferes with estrogen detoxification in the liver and raises the levels of estradiol in the blood. The higher estradiol levels can initiate breast cancer[8].

The primary causes of exogenous estrogen exposure are known to occur because of environmental and chemical toxins. These may be plant-derived estrogens, mycoestrogens – fungi-derived, and mycotoxins[9]. Several industrial synthetic compounds such as phthalates, polychlorinated biphenyl, and bisphenol are deemed to be the major sources of exogenous estrogen exposure. The presence of estrogenic compounds in food and dairy products is a matter of great health concern worldwide. The xenoestrogens that are present in pesticides and herbicides enter our food supply. In addition to the human response to environmental estrogens, hormones that are utilized to enhance milk production and livestock also boost human sensitivity to environmental estrogens. The increased threat of breast cancer may also be involved with antibiotics present in the food supply that alters the intestinal flora engaged in the enterohepatic circulation of estrogens. Different factors influence hormone imbalances in many facets of life[10].

IMPACT OF HORMONE IMBALANCE IN SLEEP AND STRESS

Sleep and rest are important and are an essential part of safe and happy living. Sleep emphasis on body processes to heal and revitalize. Lack of sleep can also impede different

metabolic activities. When the disruption starts, it turns out to be further evident with time and age. It is unclear whether lack of adequate sleep cause hormone imbalance or imbalance in the hormone levels contributes. Women are more often reported to have sleeping difficulties than men in most life phases[10]. Women are more prone to sleeping difficulties i.e., twice the rate of men. The estrogen hormone is specifically associated with sleep. Any flux or reduction of estrogens induced by anxiety, physical stress such as exercise, consuming a low fat/low carbohydrate diet, drastic weight loss can result in disruptions in sleep, restiveness, and anxiety[12]. A perturbed sleeping pattern affects fertility by modifying the pattern of ovulation. Adipocyte-derived hormone known as leptin is proven to be linked with sleep and fertility¹³. The development of sufficient amounts of leptin entails normal sleep. Reduced sleep time reduces the production of leptin and raises ghrelin levels. Ghrelin is a strong appetite stimulator and is developed by the specialized stomach and pancreatic cells. Leptin works to reduce food intake with the central nervous system and to boost energy consumption. Leptin insufficiency raises appetite and induces obesity[14].

Increased leptin concentrations have also been reported to lessen appetite and decelerate the basal metabolism linked to obesity[15]. This could describe the adverse effect of leptin's potential impact on fertility. Serum hyperleptinemia greatly triggers women's infertility. Leptin obliquely controls ovarian folliculogenesis via the Luteinizing Hormone and follicle-stimulating hormone levels. The increase in the levels of leptin, luteinizing hormone levels, time, and ovulation are relatively linked to one another[15][16]. When sleep becomes disrupted, leptin levels impair ovulation, which may contribute to erratic menstrual cycles and a decline in fertility i.e., conceivability. Women working at nightshifts have been reported to have irregular menstrual cycles with interruptions and difficulty retaining normal patterns of sleep[17]. Unusual light-dark times influence hormone melatonin levels and result in the lack of progesterone leading to living in stress. This induces imbalances in the relationship between progesterone and estrogen and triggers vaginal dryness, urinary tract infections, articular pain, and an increase in weight. All of this can disrupt sleep[18]. Mild hypothyroidism entailed with lower development of progesterone and sleep issues. Sustained stress levels also induce high cortisol and adrenaline levels from the adrenal gland, which repress the immune system and bring about insomnia in women.

HORMONE DISTURBANCE, WEIGHT GAIN, AND WEIGHT LOSS

The basal metabolic rate for the body is also considered to be controlled by thyroid hormones. Any decline or surge in secretion levels may lead to various physiological modifications. Hypothyroidism induces an increase in weight, despair, loss of hair, low energy, and dry skin. Hyperthyroidism triggers weight loss, constant heating of the

body due to higher metabolism, and elevated level of energy. Disruptions in the amount of cortisol often contribute to gain in weight[19]. Cortisol influences the levels of glucose and insulin, inflammatory reactions, bone matrix accumulation, building of muscles, mood and concentration, endurance, sex drive, and sleeping cycle patterns. Increasing stress can lead to fluctuating cortisol levels, causing blood sugar and insulin discrepancies, food cravings, and thyroid function mitigation. These factors contribute to a decline in the metabolism and thus raises weight[20].

HORMONE IMBALANCE AND INSULIN RESISTANCE

Carbohydrate, protein, and fat metabolism are regulated by the insulin produced by the pancreas. It lowers the level of blood glucose soon after a blood meal. The body's capability to produce and utilize insulin effectively to maintain blood sugar at optimum concentrations for efficient metabolism defines excellent health[21]. Insulin-level disruption is the source of numerous disorders. The cells do not act in response to insulin when insulin signals are dropped. This is called insulin resistance, and this marks an increase in the amount of blood glucose and fat deposition contributing to obesity and type II diabetes[22].

HORMONE IMBALANCE AND POLYCYSTIC OVARIAN SYNDROME (PCOS)

PCOS is an endocrine condition and a common cause of chronic anovulatory, hyperandrogenic, and infertile menstrual disorders. Approximately 10% to 13% of all women of childbearing age are registered with infertility and anovulation symptoms[23]. Different metabolic ailments owing to PCOS were also identified. Several female ovaries are polycystic, others suffer from single ovarian cysts. The primary cause of PCOS is found to be insulin resistance.

HORMONE IMBALANCE AND DEPRESSION

Several studies have demonstrated that estrogen is essential for sustaining the level of a neurotransmitter known as serotonin. Serotonin is vital for the prevention of bloating, mood swings, petulance, migraine, and depression. Reduction in the levels of insulin will have a direct impact on the reduction in the concentration of serotonin. Reduced serotonin will lead to despair, worrying attitude, and insomnia[24]. Reduced estrogen levels can lower levels of serotonin, leading to depression, fear, and insomnia. The use of estrogen is stated to boost the supply of serotonin by decreasing the breakdown of serotonin and changing the mRNA and protein concentrations of different markers[25]. These impacts may have immediate repercussions for female mood swing-associated complications such as premenstrual disturbances and depression during pregnancy, postpartum, and menopause. The synthesis and delivery of several neurotransmitters and neuropeptides are modulated in response to certain physiological and pathological stimuli such as progesterone and several synthetic progestational

agents. Progesterone affects and calms the body's receptors in the brain known as gamma aminobutyric acid[26]. It contributes to alleviating changes in mood, petulance, and depression. Any disturbances in the estrogen-progesterone proportion can therefore be stated to modify mood and trigger depression. Higher levels of cortisol are also reported to cause sleeping disorders, despair, anxiety, and trouble in managing stress. Reduction in thyroid hormone levels likewise affects the body's metabolism and causes depression[27].

OTHER COMPLICATIONS

Complications associated with reproduction and the reproductive system have evolved due to environmental trepidations or alterations in dietary behaviour. The presence of xenoestrogen in the diet may be a significant cause of hypothyroidism, fibromyomas, uterine fibroids, adenomyosis, and breast cancer in the body[28]. This has contributed to a precipitous depression in the levels of estrogen, progesterone, and testosterone and result in the surgical removal of the uterus and ovaries. This can lead to osteoporosis, muscle mass, anxiety, and depression. Several studies suggest that hormonal imbalance is more frequent in women and result to causes hypersensitivities, autoimmune disorders, and hypothyroidism[29]. The indications of hormonal allergies are serious and can result in pregnancy loss and severe psychological stress[30].

CONCLUSION

For a strong mind and body, hormone balance is essential. Any naturally occurring disorder or variations in puberty, perimenopause, and menopausal conditions can trigger life-threatening complications in women. Aging is one of the natural factors that can impact the body's hormone balance. Additional considerations are environmental toxins such as xenoestrogen, diets rich in fats, foods rich in sugar, prolonged intake of medications, the paucity of physical exercise, and genetically modified food and dairy products. Hormone imbalance can be rectified with a balanced and healthy diet. The diet, changed and balanced, can be reversed. The use of insect repellent, pesticides, herbicides, and several other substances employed to improve productivity required to be minimized. Modest workouts or brisk walks will control cortisol levels and sustain the metabolism of glucose. Hormone restructuring will improve safety and prevention against different chronic illnesses. It is also strongly recommended that well-qualified healthcare consultants help them to keep their lives safe.

REFERENCES

[1] Silva AP, Guimaraes DE, Mizurini DM, Maia IC, Ortiz-Costa S, Sardinha FL, et. al. Dietary fatty acids early in life affect lipid metabolism and adiposity in young rats. *Lipids*. 2006; 41(6):535-541.

[2] Markowski VP, Currie D, Reeve EA, Thompson D, Wise JP Sr. Tissue-specific and dose-related accumulation of arsenic

in mouse offspring following maternal consumption of arseniccontaminated water. *Basic Clin Pharmacol Toxicol*. 2011; 108(5):326-332.

[3] Blüher M. Adipose tissue dysfunction contributes to obesity related metabolic diseases. *Best Pract Res Clin Endocrinol Metab*. 2013; 27(2):163-177.

[4] Naveed S, Ghayas S, Hameed A. Hormonal imbalance and its causes in young females. *J Innov Pharm Biol Sci*. 2015; 2(1): 12-16.

[5] Khyade RL. A study of menstrual disturbance in cases of fibroid uterus. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*. 2017; 6(6):2494-2497.

[6] Haffner SM. Sex hormone – binding protein, hyperinsulinemia, insulin resistance and noninsulin dependent diabetes. *Horm Res*. 1996; 45(3-5):233-237.

[7] Malekinejad H, Rezabakhsh A. Hormones in dairy foods and their impact on public healthA narrative review article. *Iran J Public Health*. 2015; 44(6): 742-758.

[8] Hyman MA. The lifecycles of women: Restoring balance. *Altern Ther Health Med*. 2007; 13(03):10-16.

[9] Caserta D, Maranghi L, Mantovani A, Marci R, Maranghi F, Moscarini M. Impact of endocrine disruptor chemicals in gynaecology. *Hum Reprod Update*. 2008; 14 (1): 59–72.

[10] Roy JR, Chakraborty S, Chakraborty TR. Estrogen-like endocrine disrupting chemicals affecting puberty in humans—a review. *Med Sci Monit*. 2009; 15 (6): RA137–145.

[11] Burgard SA, Ailshire JA. Gender and time for sleep among U.S. adults. *Am Sociol Rev*. 2013; 78(1): 51-69.

[12] Spiegel K, Leproult R, L'Hermite-Bale Riaux M, Copinschi G, Penev PD, Cauter EV. Leptin levels are dependent on sleep duration: Relationships with sympathovagal balance, carbohydrate regulation, cortisol, and thyrotropin. *J Clin Endocrinol Metab*. 2004; 89(11):5762–5771.

[13] Taheri S, Lin L, Austin D, Young T, Mignot E. Short sleep duration is associated with reduced leptin, elevated ghrelin, and increased body mass index. *PLoS Med*. 2004; 1(3) e62:210-217.

[14] Ahrens K, Munford SL, Schliep KC, Kissell KA, Perkins NJ, Wactawski-Wende J, et. al. Serum leptin levels and reproductive function during the menstrual cycle. *Am J Obstet Gynecol*. 2014; 210(3): 248.e1-248.e9.

[15] Taheri S, Lin L, Austin D, Young T, Mignot E. Short sleep duration is associated with reduced leptin, elevated ghrelin, and increased body mass index. *PLoS Med*. 2004; 1(3) e62:210-217.

[16] Roman EA, Ricci AG, Faletti AG. Leptin enhances ovulation and attenuates the effects produced by food restriction. *Mol Cell Endocrinol*. 2005; 242(1-2):33-41.

[17] Liira J, Verbeek JH, Costa G, Driscoll TR, Sallinen M, Isotalo LK, et. al. Pharmacological interventions for sleepiness and sleep disturbances caused by shift work. *Sao Paulo Med J*. 2015; 133(1):67.

[18] Herrera AY, Nielsen SE, Mather M. Stress induced increases in progesterone and cortisol in naturally cycling women. *Neurobiol Stress*. 2016; 3: 96-104.

[19] Wagh (patil) SD. Role of cortisol in stress, fat deposition and weight gain in women. *Int J Life Sciences*. 2016; 4 (4): 599-601.

[20] Chao AM, Jastreboff AM, White MA, Grilo CM, Sinha R. Stress, cortisol, and other appetiterelated hormones: Prospective prediction of 6-month changes in food cravings and weight. *Obesity*. 2017; 25(4): 713–720.

[21] Loverro G, Vicino M, Lorusso F, Vimercati A, Greco P, Selvaggi L. Polycystic ovary syndrome: relationship between insulin sensitivity, sex hormone levels and ovarian stromal

- blood flow. *Gynecol Endocrinol*. 2001; 15(2):142-149.
- [22] Lynch R. A case study of polycystic ovarian syndrome. (Spring 5-11-2013): Eastern Kentucky University, Encompass (Honors Thesis). 2013; pp. 1-42.
- [23] Azziz R, Woods KS, Reyna R, Key TJ, Knochenhauer ES, Yildiz BO. The prevalence and features of the polycystic ovary syndrome in an unselected population. *J Clin Endocrinol Metab*. 2004; 89(6):2745-2749.
- [24] Studd J, Panay N. Hormones and depression in women. *Climacteric*. 2004; 7(4): 338-346.
- [25] Pluchino N, Luisi M, Lenzi E, Centofanti M, Begliuomini S, Freschi L, et. al. Progesterone and progestins: effects on brain, allopregnanolone and beta-endorphin. *J Steroid Biochem Mol Biol*. 2006; 102(1-5):205-213.
- [26] Lokuge S, Frey BN, Foster JA, Soares CN, Steiner M. Depression in women: windows of vulnerability and new insights into the link between estrogen and serotonin. *J Clin Psychiat*. 2011; 72(11):e1563-e1569.
- [27] Pluchino N, Cubeddu A, Giannini A, Merlini S, Cela V, Angioni S, et. al. Progestogens and brain: an update. *Maturitas*. 2009; 62(4):349-355.
- [28] Sinaii N, Cleary SD, Ballweg ML, Nieman LK, Stratton P. High rates of autoimmune and endocrine disorders, fibromyalgia, chronic fatigue syndrome and atopic diseases among women with endometriosis: a survey analysis. *Hum Reprod*. 2002; 17(10):2715-2724.
- [29] De Coster S, Van Larebeke N. Endocrine-disrupting chemicals: associated disorders and mechanisms of action. *J Environ Public Health*. Volume 2012(2012): 52 Pages, Article ID: 713696.
- [30] Wilder RL. Hormones, pregnancy and autoimmune diseases. *Ann N Y Acad Sci*. 1998; 840:45- 50.