

A Journey from Woman to Mother: Hormonal Contribution

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Authors' contributions

This work was carried out in collaboration between both authors. Author RG designed the study, wrote the protocol and wrote the first draft of the study. Author AY managed the literature search. Both authors read and approved the final manuscript.

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ABSTRACT

Pregnancy is considered as a most beautiful event in a woman's life. It's the time of transformation of a woman into mother which is mostly dependent on hormonal influence. The word hormone has taken its origin from the Greek word "hormon" which signifies a substance which stimulate specific cells or tissues into action. As pregnancy is a journey of nine months so the impact of hormones make it a continuous process. The purpose of this article is to aware and educate women regarding importance of hormones and the significant role they play that ultimately help them in their journey from woman to mother. Although pregnancy is full of happiness, yet having so many changes could be disturbing too. Here, we are discussing about some important hormones, which are produced and changed during pregnancy and having their effects on different body systems.

Keywords: Pregnancy; hormonal influence; endocrine.

1. INTRODUCTION

Maternal adaptation during pregnancy includes a lot of changes in woman and hormones have a major contribution in it. During pregnancy not only genital organs (Uterus and Breast) have gone through the series of changes but also other systemic organs like integumentary system (skin), cardiovascular system (heart), endocrine system, renal system (kidneys), Gastrointestinal system (stomach and intestine) and many more. In short, due to the increased demand of maternal body and growing fetus, all the organs enlarge and share the responsibility of increasing demand [1,2].

If the body is unable to combat this extra demand, the growing fetus would have been suffered from serious consequences, not only in the womb but in his later life too. Would be mothers can also face some difficulties which can be life threatening. The risk of developing non-communicable diseases like heart diseases (Hypertension), diabetes (Gestational diabetes mellitus), post-partum psychosis are more common during pregnancy. It is important to prevent these complications and make the pregnancy a fruitful outcome, for that maternal hormones have a major responsibility. Lots of hormonal changes take place in a woman's body

and the major hormones are secreted by maternal glands and the placenta. Some important hormones are human chorionic gonadotrophin (hCG) oestrogen, progesterone, oxytocin, prolactin, thyroxine, insulin, human placental lactogen, renin and many more [1,2,3].

As a health care professionals, it is our duty to make the woman understand regarding changes occurring in her body are due to these hormones. She should be advised about the impact of these hormones and important diseases which can occur due to hormonal imbalance. It is always said that prevention is better than cure and during pregnancy, it is important to make the mother safe from deleterious effects and promote a positive birth outcome for both the mother and baby. The important hormones of pregnancy are:

2. HORMONAL INFLUENCE ON BODY SYSTEMS

2.1 Reproductive System

The reproductive system undergo major changes during pregnancy. Though oestrogen and progesterone are principal female hormones which are responsible for secondary sexual characteristics during non- pregnant state, but during pregnancy, they achieve their highest

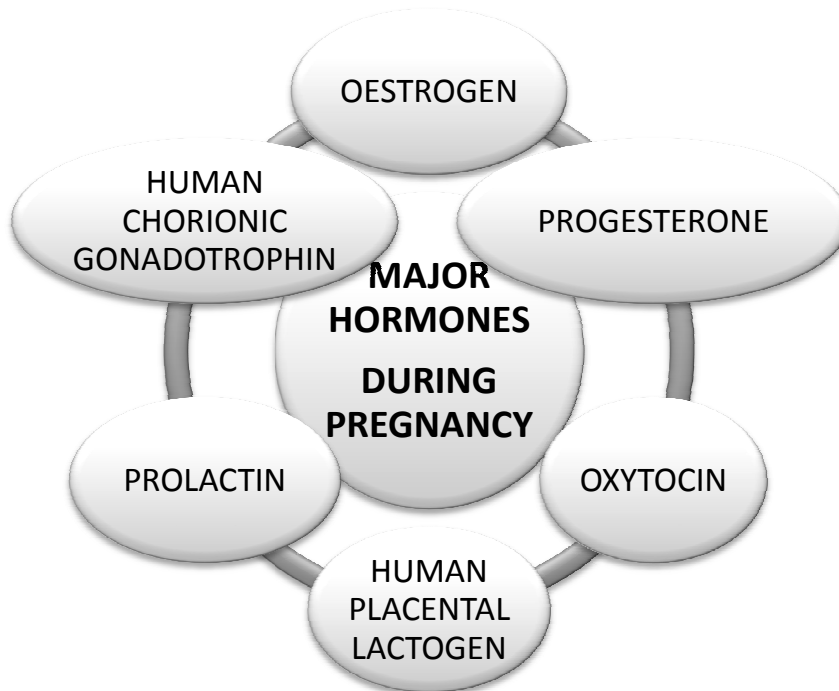


Fig. 1. Types of hormones

level to maintain and support the pregnancy and nourish the developing fetus. Where oestrogen is responsible for regeneration of decidua (endometrium of pregnant uterus), progesterone is responsible for maintenance of pregnancy [1,3]. It also have another important functions like increasing blood supply to the uterus, endometrial growth to receive fertilized ovum and preparation of pelvic floor muscles for child birth [4].

Although progesterone have a greater role in pregnancy yet oestrogen also have a variety of effects like helpful in the production of other pregnancy hormones, development of fetal organs, preparation of maternal breast for lactation etc. The high level of these hormones can inhibit the lactation process during pregnancy but some amount of milk (colostrum) production starts soon after 3 months of gestation [1,3].

The principal hormone which has been produced by the placenta is human chorionic gonadotrophin (hCG). It is secreted by the syncytiotrophoblastic cells of the placenta. Other than hCG, placenta produces hormones like human placental lactogen, placental growth hormone, oestrogen, progesterone, etc. Human chorionic gonadotrophin can be detected in maternal urine and maternal blood during pregnancy. Its major function is to stimulate the corpus luteum to produce progesterone for continuation of pregnancy until the complete development of placenta [5]. The peak level of hormone is achieved up to tenth week of pregnancy, after that it starts declining up to 16th week then it will be constant until delivery. Increased frequency of urination during first trimester is also associated with hCG, as it causes more blood flow towards kidneys which in turns starts more flushing of water out of the body. After 7- 60 days of delivery it becomes zero. Abnormally high level of hCG has been found in many trophoblastic diseases like hydatidiform mole, choriocarcinoma and germ cell tumor etc. [6].

Oxytocin is one of the leading hormone for initiation of labour pains. It is produced in the hypothalamus and secreted by the posterior pituitary gland and responsible for uterine contractions during delivery and releases breast milk during lactation. Oxytocin is also known as the cuddle hormone or the love hormone as it is secreted during emotional bonding with others. Highest level of oxytocin has been achieved

during childbirth with its continuation in post-partum period to contract the womb and prevention of post-partum bleeding. High level of oxytocin and prolactin influences the maternal bonding with a new-born [7,8,9]. Prolactin is an important hormone for breast milk production. It is produced in Pituitary gland and can affect the fertility of a person because its high level in the blood would stop the production of oestrogen from ovaries [10]. Human placental lactogen (hPL) is thought to be responsible for embryonic growth and have a link with insulin-like growth factors (IGFs) [11].

Some others hormones like relaxin is also produced in the female body by corpus luteum both in pregnant and non-pregnant state. Its significance has been seen in preparing the endometrium for nidation with other hormones and softening of the symphysis pubis during delivery. It was also found that it promotes wound healing and helps in lowering the blood pressure [12,13,14].

2.2 Integumentary System

As pregnancy is the state of high hormone level and they have an effect on most of the body system, but skin would have some of the significant changes. Hyperpigmentation of skin like areola and nipple on the breast, line nigra (Latin word for black line) a black dotted line extending from umbilicus to the symphysis pubis, melasma which is commonly called as pregnancy mask have been seen in most of the women during pregnancy. Hyperpigmentation in pregnancy is due to melanocyte-stimulating hormone secreted by placenta [15]. Oestrogen has also its impact on skin as it creates glow of pregnancy [1].

2.3 Haematology and Cardiovascular System

Demand of oxygen and nutrients are increased due to growing fetus, so cardiac output will be increased during pregnancy. Estrogen has its important contribution in increasing overall blood volume [1]. Initially, blood pressure may fall but, it will be normal in later pregnancy. Plasma volume also increases with less rise in red blood cell volume. This may lead to physiological dilutional anemia. Pregnancy is a hypercoagulable state due to increase in clotting factors and fibrinogen, so it keeps the woman on thromboembolic disease. Progesterone is also associated with venodilation and stasis of blood [4].

2.4 Gastrointestinal System

Gastrointestinal changes occur during pregnancy to provide sufficient energy and nutrition to the fetus. High levels of oestrogen, progesterone and human chorionic gonadotrophin are responsible for GI functional mediation. Progesterone is responsible for reduced GI motility and relaxes cardiac sphincter, which leads to gastroesophageal reflux which is commonly seen during pregnancy. Relaxation of gall bladder is also associated with progesterone and may lead the pregnant woman to get gall bladder stones. Morning sickness is one of important symptom experienced by pregnant woman, which is thought to be due to human chorionic gonadotrophin (hCG) [3,4,5,6].

2.5 Endocrine System

Pregnancy is associated with lots of changes, but it is important to detect deviation from normal parameters. Some common medical problems which are associated with hormonal disturbances are Gestational diabetes mellitus, hypertension, iodine deficiency disorder and thyroid disorders etc. High level of oestrogen and hCG cause increase in thyroid stimulating hormone (TSH), T3 and T4 levels. These hormones are necessary for fetal brain and nervous system development [16]. They also have an effect on maternal metabolism, weight management, temperature maintenance etc. [17]. Iodine is an important mineral required for proper functioning of thyroid gland and its deficiency can cause dip in the thyroid hormone production. Disturbance of these hormones can lead to hypo or hyperthyroidism and iodine deficiency that can put the fetus on risk of severe mental impairment [18,19,20,21].

Gestational diabetes mellitus is also associated with some hormones like oestrogen, cortisol and human placental lactogen which blocks the hormone insulin [11]. Thus, pregnancy is called as the state of insulin resistance. Due to insulin deficiency, cells will be unable to utilize glucose and it will remain in blood and leads to higher blood glucose level. High blood glucose level poses the fetus at risk of developmental birth defects and in early pregnancy, it can lead to damage of woman's eyes, kidneys, heart, blood vessels and nerves, etc. [22,23]. Hypertension in pregnancy is caused by abnormally active renin-angiotensin mechanism which leads to vasoconstriction and sodium and water retention [24].

2.6 Urinary System

In urinary system, the kidneys play a remarkable role in creating the hormonal milieu during pregnancy. Renin which is also known as angiotensinogenase is the hormone produced by the kidneys and regulates the mean blood pressure of the body. There is a drop in blood pressure in the initial stage of pregnancy and the factors responsible for this may be altered renin-angiotensin-aldosterone system (RAAS) and hormonal disturbances [2,24]. Progesterone is thought to be responsible for increased glomerular filtration rate (GFR) and renal plasma flow (RPF) [3,4].

3. CONCLUSION

Pregnancy has remarkable changes under the influence of hormones which are needed to adjust with this physiological state. Though hormonal changes are necessary for a smooth functioning of body systems during this period yet they can alter physical as well as psychological state of the women. Disturbance of these hormones can adverse a normal pregnancy into a complicated one. Hormonal milieu has a greater impact in this journey of becoming the mother from a woman.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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