

## Health Ailments of Asian Women in Pregnancy

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### ABSTRACT

Pregnancy may be defined as a condition when a female conceives the fertilized ovum in her uterus and it matures and develops with time to a full grown baby. The average length of human gestation is 280 days, or 40 weeks, from the first day of the woman's last menstrual period. <sup>[1]</sup> During this period of time, the developing embryo derives all its necessary nutrition and requirements from the mother's body. And the woman's body undergoes several consecutive sequential physiological changes to adapt to the new situation of the growing foetus inside her womb. Though most of those changes are reversible yet some changes the mother has to carry for the rest of her life.

**Key words:** Pregnancy, ovum, embryo, foetus, womb

### INTRODUCTION

Motherhood is considered as a blessing. The pleasure of giving birth to a new one is immense but together with the journey of pregnancy comes several physiological changes and health ailments of the woman who bears the baby in her womb. In earlier days, the highest rate of death of women in India was due to maternity and maternity related complications. The most reported one being due to excessive bleeding accompanied by lack of timely medical intervention. With development of science, advancements in medical science and increased awareness, the situation is better these days. Death rate of pregnant women and death rate due to maternity related complications has significantly gone down around the world including various Asian countries like India. A study conducted by WHO, published in the Lancet Global Health, involved

examining the causes of more than sixty thousand maternal deaths in hundred and fifteen countries. <sup>[2]</sup> It has been found that pre-existing medical conditions such as diabetes, HIV, malaria and obesity are responsible for at least one in four maternal deaths. Health impacts of such pre-existing medical conditions can be aggravated by pregnancy. A quarter of such maternal death is accounted due to severe bleeding during pregnancy and childbirth. <sup>[2]</sup> Studies reveal that poor access to healthcare and maternal mortality is disproportionately higher in rural populations of the poorer states of India. <sup>[3]</sup>

Every woman's health is different and so comes the issues of different health ailments in individual mother. One of the most known health problem that arrives with pregnancy is 'gestational diabetes'. Gestational diabetes is a condition when the level of glucose is higher than normal in

pregnant women. [4] Normally the increased level of glucose goes down after baby is born. Unfortunately, gestational diabetes enhances the risk of developing type II diabetes in mother as well the baby in later stage of life. High level of glucose is not good for the normal development of the baby. [5,6] The other pronounced and significant health issue that can add to complications of pregnancy is 'Rh-incompatibility'. [3] Some pregnancy is encountered with problems of infection. And other significant health issue in pregnancy is increased or decreased level of Thyroid Stimulating Hormone (TSH) and / or thyroxine. For patients who are already diabetic, should bring the level of blood glucose down to normal before conceiving in order to avoid diabetes related complications in pregnancy. Thus it is extremely important and significant to maintain the level of blood glucose near normal before and during pregnancy in order to ensure good health of both mother and baby. [7,8] Thus pregnancy is a complicated journey of nine months for the mother.

### **Mother's health in the 1<sup>st</sup> trimester**

#### ***Physiological changes***

First trimester refers to the first three months of pregnancy. The first trimester is considered to be the most critical phase of pregnancy. Level of hormones like progesterone and prolactin associated with pregnancy and produced by placenta start rising significantly. Adequate progesterone is essential for maintaining the pregnancy. Luteal phase insufficiency is reported as one of the reasons for implantation failure and has been found to be responsible for miscarriages. [9] Low level of progesterone or any chromosomal abnormality in embryo may lead to early miscarriage and loss of fetus. [10] Doctors advice to have maximum precaution during this phase. The embryo begins to derive nutrition from the mother's body and starts growing. Cells divide rapidly. The first trimester leads to several big changes in mother's body. Hormones induced changes occur in mammary glands.

They become tender and proliferation of cells occur. Studies show that certain maternal characteristics i.e., maternal weight and smoking habit etc., influence concentration of maternal hormone during the first trimester pregnancy. [11]

#### ***Changes in Cardiovascular System***

Certain cardiovascular changes occur in the mother during the first trimester. [12] Though the changes are not actually realised by the mother but are clinically accessed. Plasma volume gets on increasing. [13] Little rise in plasma volume occurs during the first trimester which is followed by a progressive increase. Blood volume in mother reaches peak level by around thirty four weeks of pregnancy after which no further rise is observed. [14] Significant volume of blood is lost from the mother's body during labor, delivery and postpartum. Normal delivery of baby or delivery of baby by C-section surgery both involves loss of significant volume of blood from mother's body. Though body tries to meet up the loss and requirement of blood by the body by increasing the volume of blood in mother's body during the period of pregnancy yet often transfusion of blood becomes essential to save mother's life during delivery and postpartum. Timely and proper transfusion of blood is known to significantly reduce maternal mortality. [15]

#### ***Changes in Urinary System***

Increased rate of urination is one of the marked changes in early pregnancy. In the first trimester as a result of increased blood volume, the kidney starts filtering more blood, producing increased volume of urine. Progesterone is also known to play some role in increasing urinary volume during pregnancy. [16] The uterus begins to grow in size and imposes pressure on the urinary bladder and as a result of which mothers experience urge for frequent urination from the beginning of her pregnancy days. But adequate fluid intake should be maintained by the mother for maintaining adequate volume of blood, amniotic fluid and in order to avoid

dehydration and dehydration related other complications during pregnancy days. Routine examination (RE) of urine is initially advised by the doctor which if yields doubtful results is followed by urine culture test in the first trimester. Urinary tract infection is not a very rare thing observed in pregnant women specially in working women who have to use public toilets in their work places. Urinary tract infections are always serious health issues and should be diagnosed properly and timely. [17]

### **Changes in Respiratory System**

A stuffy nose or a clogged nose is a very common experience reported by pregnant women in the first trimester. Also, faster, deeper breathing and respiratory discomfort are experienced by many pregnant women during the first trimester of pregnancy and it remains throughout the period of pregnancy. Tidal volume increases and this causes reduced Inspiratory reserve volume during the early months of pregnancy. [18] The pregnancy hormone, progesterone is the key player in the story. Progesterone changes the level of carbon dioxide in blood and thus stimulates various respiratory reflexes in the pregnant woman's body. Some women experience a situation called pregnancy rhinitis. The nose remains stuffy and is often accompanied by headache and rhinitis. [19]

### **Digestive Changes**

Progesterone is produced in the pregnant mother's body and the hormone influences all physiological processes in the woman's body. The most pronounced effect is often experienced on the digestive system of pregnant women. Progesterone decreases the motility of the digestive tract and thus induces various types of digestive disorders. [20,21] The most common experience in the first trimester is nausea and vomiting. Various digestive symptoms experienced during early pregnancy are together termed as 'morning sickness'. Most women experience morning sickness during first trimester but in some individuals the situation prevails throughout the period of

pregnancy. [22] If nausea, anorexia, vomiting becomes severe it may affect mother and baby's health adversely and so proper and timely medical advice should be availed. Pregnant women may experience a pathological condition termed as 'hyperemesis gravidarum' which is diagnosed when the pregnant woman gets extremely sick due to severe dehydration which occurs due to vomiting during pregnancy. In other words, 'hyperemesis gravidarum' is a synonymous term for severe morning sickness in pregnant women. [22-24] There are effective and safe medications available to treat morning sickness in pregnant women but any kind of medication should be availed during pregnancy only with doctor's advice. Easily digestible foods should be consumed in order to avoid indigestion and other digestive disorders. [23]

### **Changes in Skin**

Progesterone surge in pregnant mother's blood often causes acne during early pregnancy. The skin issue continues in some women throughout the entire period of pregnancy while in some other women the skin problems goes away after first trimester. [25] The area around the nipple and the areola becomes darker in colour due to progesterone induced accumulation of melanin. During early pregnancy, small bumps appear on areola. They are termed as 'Montgomery's tubercles'. [26]

### **Musculoskeletal Changes**

Under the influence of the hormone relaxin, joints and ligaments of pregnant women loosen from the first trimester. This is actually an adaptive change in the mother's body for accommodating the growing baby in the pelvic cavity and also for giving birth. Though, the musculoskeletal changes are not much pronounced during the first trimester. [27] Mothers' often experience back pain from the early days of pregnancy and the condition worsens with progression of pregnancy. Medicines are not safe during pregnancy and so doctors generally prescribe pain ointments and pain relief sprays. Any old muscle pain or skeletal pain

or injury may worsen during the period of pregnancy. Pains due to arthritis or sciatica are also observed to be worsened during pregnancy. [28]

### **Psychological changes**

Pronounced hormonal changes occur during pregnancy and it begins from the early days. Those hormones cause tremendous emotional changes in the pregnant mother. Excitement, anxiety, happiness, worries various combined emotions occupy the would be mother's mind. The mother's body begins undergoing several sequential changes from day one of conception. Along with those changes, the pregnant mother gets new experiences, becomes susceptible to emotional stress and outburst. The woman becomes emotionally vulnerable and short tempered. [29,30]

### **Mother's health in the 2<sup>nd</sup> trimester**

#### **Physiological changes**

The fourth, fifth and sixth months of pregnancy are termed together as the second trimester. The pregnant mother gets somewhat habituated and accustomed to her altered physiological conditions. The body still continues undergoing changes.

#### **Changes in Cardiovascular System**

The mother feels her strong heartbeats during the second trimester of pregnancy. Excitement can cause palpitations. In some women blood pressure increases (in 6-8% women) and leads to hypertensive condition and require proper medical interventions. Hypertension related disorders have been found to be one of the prime causes of pregnancy related maternal mortality. [31,32] Healthy lifestyle, keeping oneself away from stress and proper balanced diet is extremely essential for maintaining good health of pregnant women. Blood volume goes on increasing during the months of second trimester as well. Under the influence of the hormones, the blood vessels dilate and hypotension is observed in most women in the middle of second trimester. [33]

#### **Changes in Urinary System**

Urge for urination becomes more frequent. As the baby goes on increasing in

size, the uterus also keeps expanding and as a result, increasing pressure is exerted on the urinary bladder. Fluid supplementation is to be continued in the form of consumption of enough fluid. The renal blood flow increases and glomerular filtration rate (GFR) also increases. Increased renal blood flow causes an increase in renal size of 1–1.5 cm. The renal size reaches the maximal size by mid-pregnancy, in the second trimester. Mechanical compressive forces on the ureters causes dilatation of the kidneys, pelvis and calyceal systems. All these changes are brought about due to increased level of progesterone in pregnant women's blood. Progesterone, decreases ureteral tone, peristalsis and contraction pressure. [34]

#### **Changes in Respiratory System**

Nasal congestion is experienced by most women in the second trimester of pregnancy. During normal pregnancy, demand for oxygen significantly rises. This occurs due to increase in the rate of metabolism and increased oxygen consumption. Respiratory rate doesn't alter but tidal volume increases. There occurs an increase of 40-50% in minute ventilation. This hyperventilation causes an increase in arterial pO<sub>2</sub> and decrease in pCO<sub>2</sub> and a decrease in level of serum bicarbonate in pregnant mother's blood. [35] Expiratory reserve volume (ERV) decreases, functional residual volume (FRV) decreases and inspiratory capacity (IC) increases during the second trimester. Respiratory conductance decreases during pregnancy and respiratory resistance increases. [36]

#### **Digestive Changes**

Wernicke's encephalopathy is observed in some women during pregnancy and Thiamine supplementation is important in order to avoid the same. [37] As pregnancy progresses, the uterus increases and reaches a significant size by the second trimester as a result of which, a mechanical changes in the alimentary tract occurs. The stomach is increasingly pushed upwards and gastric pressure increases. The tone of oesophageal sphincter gets diminished and these factors

lead to reflux, as well as nausea and vomiting. [38,39] Oestrogen and progesterone levels changes significantly during the days of pregnancy. Altered levels of these hormones causes structural changes in the gastrointestinal tract.

Changes in oestrogen and progesterone levels also influence the structural alterations in the gastrointestinal tract and gastric muscle tone leading to gastric dysrhythmia or gastroparesis. Though in most women, the morning sickness and vomiting tendencies are relieved to some extent during the second trimester. [40]

#### **Changes in Skin**

As the baby grows within the mother's womb, mother not only gradually gains weight but also the uterus enlarges in size within the pelvic cavity and causes stretch marks in the abdomen. With increasing progesterone and other pregnancy associated hormones like prolactin etc., cells of mammary gland proliferates and breast enlarges and this also causes stretch marks. Use of olive oil and other hydrating agents may smoothen the skin and help to cope with stretch mark formation. [41,42]

#### **Musculoskeletal Changes**

Musculoskeletal changes are very prominent. Lordosis is observed in cervical and lumbar vertebrae. Back ache is often observed and is increased during the second trimester. Weight of the growing baby adds to the body weight of the mother and also changes the centre of gravity. The line of gravity shifts forward and anterior. This alteration is adjusted by spontaneous increased activation of gastrocnemius muscle and soleus muscle. An active posterior displacement of the body, extension of hip joint, increase of the lumbosacral angle, increase in lumbar curvature or a displacement of pelvis anteriorly and shoulder posteriorly occurs. Stretching of abdominal muscle occurs. [43] Ligamentous tensile strength is decreased as a result of which hypermobility of joints occur. Connective tissue proliferates under the influence of oestrogen and relaxin

promotes vascularisation and softening of connective tissue. Often lesser sensitivity of hypermobile joints occurs. [44] Disturbances of the perception of position and movement of joints and of the reflexes concerned with posture and gait. It is observed that during second trimester of pregnancy, a part of normal range of motion is not controlled and this often leads to enhanced shear forces, pain and little trauma. Pain is reported to be experienced by mothers in various regions which include lumbar region, area above lumbar region, pain over the sacroiliac region etc. Pain is often radiated to one or both legs and leg cramps are also experienced in some. [45]

#### **Psychological changes**

Psychological disturbances, mood swing and irritability all gets eased to some extent during the second trimester. Women get much more accustomed to her changing physiological changes. The sense of movement of baby within the womb soothes the various mental and physical troubles with which the mother's body continuously fights. [29,30]

#### **Mother's health in the 3<sup>rd</sup> trimester**

##### **Physiological changes**

Pregnancy may also be accompanied by a subjective feeling of breathlessness without hypoxia. This is physiological and is most common in the third trimester but may start at any time during gestation. Classically, the breathlessness is present at rest or while talking and may paradoxically improves during mild activity.

Inspiratory reserve volume is reduced early in pregnancy, as a result of increased tidal volume, but increases in the third trimester, as a result of reduced functional residual capacity. Total pulmonary and airways resistances tend to decrease in late pregnancy as a consequence of hormonally induced relaxation of tracheobronchial tree smooth muscles. Pulmonary static and dynamic compliance, diffusing capacity and static lung recoil pressure do not change during pregnancy. [46]

##### **Changes in Cardiovascular System**

Fetal demands for nutrition and metabolism is an important compulsion for cardiovascular adaptive changes during the days of conception. Although there is a sustained increase in blood volume till mid pregnancy, a plateau in this rise is reported by some studies [47,48] however others have argued to a continued increase until delivery. [49,50] Plasma volume increases at a greater proportion compared to red cell mass demarking a tendency of physiological anaemia. [51] Elevated blood volume in concurrence with higher cardiac output leads to mild increase in left ventricular dimension and wall thickness. [52] However cardiac filling pressure is not higher than postpartum. The raise in cardiac output is however less than that compared to that of second trimester. Unlike the elevated stroke volume, the raised heart rate preferentially may be the cause for changes in the cardiac output in this period of gestation. [53] Electrocardiographic studies showed decrease in PR interval could be due to shortening of A-V conductance with respect to increase heart rate accompanied during pregnancy. In addition, blood pressure fall is a common symptom in the first and second trimester; third trimester shows a recovery of the same to that of normal. [54]

#### ***Changes in Urinary System***

Changes in cardiac output and blood pressure during gestation is manifested to some extent in renal function yielding to higher Glomerular Filtration Rate (GFR) and renal plasma flow associated with hydroureter and hydronephrosis. [55] However specific changes occurring in third trimester include nocturia, reduction in serum anionic gap, [56] increased protein excretion (about 180 to 200 mg/day), [57] transient diabetes insipidus owed to increased vasopressinase activity [58] etc.

#### ***Changes in Respiratory System***

Expansion of the uterine dimension may be a reason for diaphragmatic elevation indicating a decline in functional residual capacity. However vital capacity remains unaltered since chest diameter expands due to the upward pressure. Further recovery of

inspiratory reserve volume to normal is observed. Peak expiratory flow rate and FEV1 remains unaltered. [59,60] A feeling of breathlessness without hypoxia is a common observation in this period. Respiratory rate is higher so as prevent CO<sub>2</sub> accumulation.

#### ***Digestive Changes***

By the third trimester of pregnancy, mothers get somewhat accustomed to the troubles with digestive system. Still in some individuals the digestive problems prevail. Frequent hunger cramps are experienced. Also, the growing baby starts to move rapidly and frequently from the onset on third trimester in usual. Upward movement of the baby and growth of the uterus pushes the stomach upwards and results in frequent gastric reflux and heart burn. [38,39]

#### ***Changes in Skin***

Physiological changes in the integumentary system in pregnant females are a manifest of hormonal alterations. Pruritic folliculitis visible on shoulders, upper back, arms, chest, and abdomen are common in some females at in advanced stages. [61] Intrahepatic cholestasis of pregnancy (ICP) is usually visible in the last trimester. [62] Pruritic urticarial papules and plaques may also appear during this trimester. [63]

#### ***Changes in Musculoskeletal system***

Postural changes during pregnancy may be attributed to the gain in weight, uterine expansion, shift of centre of mass, skeletal changes, laxity of ligaments and soft tissues as influenced by hormones especially estrogen and relaxin. During third trimester a reduction in gait velocity is visible compared to the other stages is found. Maximal push pull forces of arms in standing and sitting posture is less and loss of equilibrium with activities is quite common. In working ladies a complaint of postural fitness at work-station is seen especially in jobs at sitting posture that that may be attributable to trunk flexion in this period. [64] Many women undergoing this period encounter morning stiffness of upper and lower limb joints and pedal edema that may be an outcome of fluid accumulation

and inadequate blood circulation. [65] Hormones of pregnancy may lead to widening of linea alba leading to curving of two bellies of the abdominal rectus muscle with a maximum of 50mm leading to diastasis termed as diastasis recti. [66] During the period of pregnancy, the brain continuously receives feedback from the skin, muscle and joints. The brain reconfigures its image of the changed body and eventually, by the third trimester, the brain gets accustomed to the changing body weight and posture. Weakening and overstretching of upper back muscle occurs. Shortening of upper back flexors, pectoral muscles and shortening and tightening of hip flexor muscles also occur in the third trimester.

### **Psychological Changes**

Estrogen and progesterone level peaks in this trimester. Placenta is the main source of progesterone and other hormones like leptins, estrogens, HCG, HPL etc. [67] Leptin level elevates compared to second trimester thereby reducing appetite and generates satiety. 50-80% reduction in insulin sensitivity is found. [68] Mean parathyroid related protein is also higher than other trimesters. [69] Placental and fetal release of corticosteroid binding globulin, elevated corticotrophin releasing hormone leads to increased cortisol level. [68]

Gravidity is associated with critical neuro-muscular disturbances which may be due to maximal distension of uterus in this trimester. Vascular stasis may result in sensory changes in legs. Acroesthesia may be present. [70] Edema in the peripheral nerves may cause carpal tunnel syndrome. [71] Dorsolumbar lordosis may cause neural pain. [72] Other changes like food aversion due to increased olfactory sensitivity that occurs during first trimester may be reduced and the female may become hypoosmotic. [73]

### **CONCLUSION**

Pregnancy is not a disease. It is a different physiological condition, marked with several physiological changes and

adaptations in the women's body. Most of the changes are temporary though some remain forever for the rest of the life of the woman who completes the entire period of gestation. Different types of physiological and psychological changes are experienced by the mother during the three different trimesters of pregnancy. Thus though motherhood is a blessing, a new life is formed during the period, yet it is not a very easy journey for the mother. Pregnancy also has several health benefits for the mother. [74] Proper awareness of the changes those occur during pregnancy to be spread among women who are pregnant, women in reproductive age group. Awareness among men is equally important. Timely, regular and proper medical intervention is necessary to maintain a healthy pregnancy and to minimise pregnancy associated health ailments. Also a rich, balanced and proper daily diet is important during the period of gestation. More detailed studies need to be conducted on expecting mothers to assess their health status for implementing better health care for pregnant mothers. Only healthy mothers can give birth to healthy babies and healthy babies are the keys to a beautiful tomorrow of mankind. Thus, it is utmost important to maintain and take good care of mothers' health, in every strata of the society, before, during and after pregnancies.

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### Conflict of Interests

Authors declare no conflict of interests.

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