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Journal of Women Health Care and Issues
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Open Access

Short Communication

What Brings Pregnancy to You?

PD Gupta

Former, Director Grade Scientist, Centre for Cellular and Molecular Biology, Hyderabad, India.

***Corresponding Author:** PD Gupta, Former, Director Grade Scientist, Centre for Cellular and Molecular Biology, Hyderabad, India.

Received date: February 05, 2025; Accepted date: February 19, 2025; Published date: February 27, 2025

Citation: PD Gupta, (2025), What Brings Pregnancy to You?, J. *Women Health Care and Issues*, *8*(3); **DOI:10.31579/2642-9756/241**

Abstract

Yes, of course, a baby. But in addition to a well-known fact, during pregnancy women undergo significant brain remodelling that persists for at least two years after the birth of the baby. The study also shows preliminary evidence that this remodelling plays a role in helping transition from womanhood to motherhood and respond to the needs of their babies that persists for longer period [1]. Wide range of changes occur in the body as soon as a woman conceives. Some even show signs during ovulation like slippery discharge, an increase in body temperature, and cramps [2]. However, in the later stages of pregnancy, many women show changes in the brain. Recent research reveals pregnancy leads to significant structural changes in the brain which are long lasting. Advanced imaging techniques have shown reductions in gray matter volume in areas related to social cognition and empathy, particularly in the prefrontal cortex and temporal lobe and activity can last long after pregnancy. Due to birthing a baby many of those changes are temporary but "some things" to the body are more permanent, like rewiring Brain and altered DNA.

Key words: pregnancy; breast; heartburn and indigestion; weight gain

Rewiring Brain During Pregnancy

The rewiring of the brain is due to hormonal changes. A study in mice found that these hormonal changes can trigger parenting instincts and change priorities. The findings show that both estrogen and progesterone act on a small population of neurons in the brain to switch on parental behaviour even before offspring arrive. In addition to regular resources of estrogens and progesterone during pregnancy an extra source- the placenta, that also produce these sex steroid hormones [3,4].

- **Estrogen:** Reduces the baseline activity of neurons in the hypothalamus, but makes them more excitable in response to incoming signals [5].
- **Progesterone:** Rewires the inputs of neurons, causing the formation of more synapses [6].

These changes can affect brain structures like the hypothalamus, which controls instinctive behaviours, and the ventral striatum, which is involved in reward processing [7]

Pregnancy and the postpartum period are characterized by an increased neuroplasticity in the maternal brain. Neuroplasticity during pregnancy is the ability of the brain to adapt and reorganize its structure and function. These changes help prepare new mothers for motherhood and bond with their babies [8]

Pregnancy induces changes in a mother's brain morphology, specifically a reduction in gray matter in regions linked to social relations, which lasts for at least two years post-birth. Estrogens are considered the principal hormones responsible for inducing these brain changes [9]. Pregnancy selectively shrinks gray matter to make a mom's brain more responsive to her baby, and those changes last for years.

When comparing the brains of women who have had children to those who haven't, researchers found mom brains had a reduced amount of grey matter. Located mostly in the outer layers of the brain, grey matter is largely responsible for performing high-level tasks like seeing, hearing, processing memories and emotions as well as decision-making [10]. Comparing MRI images taken before women became pregnant with images taken after they had given birth, the researchers found pregnancy shrinks the brain's gray matter, the pinkish-gray tissue containing the cell bodies and synapses of nerve cells.

Researchers believe the reduced gray matter is part of a process known as "synaptic pruning," where the brain eliminates certain connections in order to make new ones. In the case of parenting, reducing grey matter helps free a mom from less useful information so she can focus specifically on learning the behaviors and activities needed to raise her new baby [11,12]. It also allows her to forget some of the not-so-pleasant moments, like recovering from delivery and sleepless nights, so that she'll be willing to have more babies in the future. So, if you're a mom who's ever felt crazy for putting your car keys in the refrigerator, rest assured, there's a reason for these temporary mental lapses and they won't last forever. The grey matter in mom brains tends to return to normal after about two years.

To explore the dynamics of postpartum changes in gray matter volume (GMV), magnetic resonance imaging was performed on 20 healthy postpartum women immediately after childbirth and at 3-week intervals for

[12] postpartum weeks. The control group comprised 20 age-matched nulliparous women. The first [6] postpartum weeks (constituting the subacute postpartum period) are associated with decreasing progesterone levels and a massive restructuring in GMV [13]. The fact that the volume changes persist at 12 weeks postpartum indicates that the maternal brain does not fully revert to pre-pregnancy physiology. Postpartum neuroplasticity suggests that these changes may be particularly significant in the regions important for parenting.

Impact of C-section

Research suggests that the mode of delivery, whether vaginal birth or Caesarean section, can lead to distinct patterns of brain changes in expectant mothers, with studies showing that women who experience vaginal birth may exhibit a more pronounced decrease in gray matter volume in certain brain regions associated with social cognition and bonding, potentially facilitating stronger maternal attachment compared to those who have a C-section [14]; however, more research is needed to fully understand these differences and their long-term implications. Further, the difference in cortical trajectories could be related to the varying levels of hormones released during labour, which are typically less pronounced in a scheduled C-section [15].

A range of psychiatric outcomes that the mode of delivery is implicated in a woman's postpartum mental state. Women who had obstetric interventions (i.e., Caesarean or instrumental vaginal) had higher psychological distress following childbirth than women who had natural or vaginal delivery [16]. Obstetric interventions were related to somatization, obsessive compulsive, anxiety-related, and hostility symptoms. It was also found that having an unplanned caesarean increases a woman's vulnerability to suffer from clinically relevant psychiatric problems and probable. Post-traumatic stress disorder evoked by childbirth by as much as three folds, suggesting that a stressogenic childbirth can pose significant threat to maternal wellbeing.

Pregnancy is a unique neuroplastic period in adult life. During late pregnancy, mothers showed lower cortical volume than controls across all functional networks. These cortical differences attenuated in the early postpartum session. Results also pointed to different cortical trajectories in mothers who delivered by scheduled C-section [16]. The main findings were replicated in an independent sample of [29] mothers and [24] nulliparous women. These data suggest a dynamic trajectory of cortical decreases during pregnancy that attenuates in the postpartum period, at a different rate depending on the brain network and childbirth type.

Pregnancy represents a transformative journey marked by critical psychological adaptations to motherhood [17].

In humans, neuroimaging studies scanning women before and after pregnancy and around the peripartum suggest that first-time mothers experience a remodeling of brain architecture (18-20) that predicts postpartum maternal attachment towards the newborn. Concurrently, murine research suggests that maternal brain changes are driven by gestational hormones, including steroid hormones, and facilitate maternal behaviour [21-23].

A promising hypothesis posits that human brain changes during the maternal transition follow a U-shaped trajectory, with an initial decrease in cortical gray matter (GM) volume during pregnancy, followed by a partial recovery in the postpartum period [24]

Such neural trajectory could be driven by mirroring fluctuations in steroid hormones before and after childbirth [25] and could be further influenced by parenting experience [26, 27]

Despite these observations, no previous study has charted the complete trajectories of human brain change from pre-conception throughout pregnancy and postpartum, integrating multimodal neuroimaging data, endocrine assessments, and neuropsychological information for a precision imaging study of a single-subject [28].

Researchers have found that a mother's brain undergoes significant changes as a woman becomes a mom. The brains of pregnant women undergo a radical transformation due to hormone surges. In fact, women brains change more during pregnancy and postpartum than they do at puberty. Part of the reason for this is a process of synaptic pruning where the brain essentially cuts off function to areas that it no longer needs in order to build up the areas that are now crucial. For mothers, it appears that the outer layers of gray matter that help control muscle movement, memories, emotions, and decision making are reduced.

During pregnancy, a mother's brain partially rewires itself to better detect danger with a particular sensitivity toward angry or fearful facial expressions [29]. The strongest vigilance toward threats seems to happen during the second and third trimesters, and some researchers believe this is because mom brains are building up new synapses to help her adapt to motherhood.

Studies have found that all that synaptic pruning and neural building that fundamentally alters the physical structure of a mother's brain serves another critical purpose: empathy building. [29], when a mother bonds with her baby by tending to their needs, the part of her brain that manages empathy actually grows It turns out that mom brain doesn't vanish once your little one is no longer a baby—but that's actually not a bad thing. In some studies, [30]. like this one, researchers found that even after two years postpartum, moms did not gain back the gray matter they lost during pregnancy. And while that might seem a bit alarming, rest assured that Mother Nature has another trick up her sleeve. It is believed that one reason mom brain sticks around is because it helps mothers turn into amazing grandmas later in life. The same protective, empathetic, hyper-focused attention around tending to children seen in brain scans of new mothers appears to help grandmothers lend a hand in raising the next generation.

Common complications of pregnancy suffer with backache, headache, leg cramps or varicose veins, itch or tingling, constipation, haemorrhoids or indigestion, vaginitis or vaginal discharge, or mood changes or depression. Pregnancy can have many side effects, including:

- **Body aches:** As your uterus grows, you may feel aches and pains in your back, abdomen, groin, and thighs. You may also experience sciatica, which is pain that runs from your lower back down the back of one leg to your knee or foot.
- **Bleeding gums:** Pregnancy hormones can cause your gums to become swollen, tender, and more likely to bleed when you brush or floss. This is called pregnancy gingivitis.
- **Breast changes:** Your breasts may become larger and more sensitive due to hormonal changes that prepare them for breastfeeding.
- **Constipation:** Pregnancy hormones and the growing uterus can slow down your bowels, making it harder to pass stools.
- **Heartburn and indigestion:** These are common side effects of pregnancy.
- **Joint mobility:** Pregnancy hormones can loosen your ligaments, making you more likely to be injured.
- **Nausea and vomiting:** These are common early symptoms of pregnancy.
- **Nosebleeds:** Pregnancy can cause your nose tissues to dry out, making your blood vessels more likely to bleed.
- **Weight gain:** Weight gain is a common side effect of pregnancy.

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DOI:10.31579/2642-9756/241