

## Stress in Pregnancy: It's Implications in Mother and Child

Richu Grover 1, Neeraj Arora 2, Pankaj Srivastava 3\*

1. Associate Professor, Department of Obstetrics and Gynecology, Rama Medical College and Group of Institutions, Mandhana, Kanpur, U.P.

2. Associate Professor, Department of Anaesthesia, Rama Medical College and Group of Institutions, Mandhana, Kanpur, U.P.

3. MS, Department of Surgery Om Surgical Centre and Maternity Home, Varanasi, U.P.

\*Corresponding author: Pankaj Srivastava, MS, Department of Surgery Om Surgical Centre and Maternity Home, Varanasi, U.P, India.

E-mail: [mailtorichu12@gmail.com](mailto:mailtorichu12@gmail.com)

Received Date: November 11, 2019; Accepted Date: November 20, 2019; Published Date: December 25, 2019

Citation: Grover R, Arora N, Srivastava P. (2019) Stress in Pregnancy: It's Implications in Mother and Child. *Obstetrics Gynecology and Reproductive Sciences*, 3(2): DOI: [10.31579/2578-8965/030](https://doi.org/10.31579/2578-8965/030)

Copyright: ©2019. Pankaj Srivastava. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

### Abstract

Stress commonly associated with today's daily life has quite varied effect on pregnant females. Stress also affects general well-being of an individual but in pregnancy it is affecting two lives: the womb bearer and the one residing inside it. There is a steady rise in complications due to stress in pregnancies leading to increased rate of abortions, pre-term deliveries, PIH, GDM and IUGR in fetus. It also influences the neural development of the fetus causing adverse effects in later life.

**Keywords:** Stress, Pregnancy, Complications, Neural Development.

### Introduction

Stress in daily life is emerging as a new chapter in medicine. Stress literally means worry and pressure caused by having too much to deal with. Stress could be of two types:

1. Stress due to major life events like death of a family member or catastrophic community wide disaster.
2. Stress due to homelessness, household strain and unfavorable employment conditions. Stress due to poverty and crime.

78% of urban females experience low to moderate levels of antenatal psychological stress and at-least 6% experience high levels.

### Effect of Psychological Stress on Hormones and Cytokines

Stress affects the immune system in adverse ways. It has been depicted that effect of stress on secretion of IL-4 is negative. The peripheral levels of IL-4 which is an anti-inflammatory cytokine are decreased under the effect of stress<sup>1</sup>. IL-4 has an ability to inhibit synthesis of IL-1 $\beta$ , a pro-inflammatory cytokine and up regulate the production of IL-1 receptor antagonist<sup>2</sup>. From implantation until the end of term pregnancy, the interactions between pro and anti-inflammatory cytokines results in progression of pregnancy. Recent findings of healthy pregnancy development show a global reduction of pro-inflammatory cytokines such as TNF $\alpha$ , IL-1 $\beta$  and IL-6 and an increase of counter regulatory cytokines such as IL-10.

Psychological stress significantly increased the stimulated production of tumor necrosis factor  $\alpha$  (TNF $\alpha$ ), interleukin-6 (IL-6), interleukin-1

Receptor antagonist (IL-1Ra) interferon gamma (IFN- $\gamma$ ) and a lower production of negative immune-regulatory cytokines, IL-10 and IL-4<sup>3</sup>.

### Effects of Stress on Pregnancy

1. **Infertility:** One of the major causes of increased infertile couples is stress. Stress could be inter-relationship stress or work stress. Infertile couples report significantly more symptoms of anxiety and depression than fertile ones<sup>4</sup>.
2. **Miscarriage and Pre-Term Deliveries:** High levels of stress may lead to early pregnancy loss and even pre-term deliveries. Gravid uterus produces high levels of IL-4 which increases gradually throughout pregnancy. Normal pregnant women show • levels of IL-10 production during 1<sup>st</sup> and 2<sup>nd</sup> trimester but not in 3<sup>rd</sup> trimester<sup>5</sup>. A recent study concluded that low levels of circulation of anti-inflammatory cytokines during early gestation were associated with habitual abortion in females<sup>6</sup>.
3. **Preeclampsia:** Females with stress have an increased propensity of preeclampsia. Females with preeclampsia have been reported to have decreased levels of IL-4 and increased circulation levels of soluble IL-4 receptors compared with normotensive pregnant females<sup>7</sup>. It has been observed that administration of IL-4, IL-10 alone or IL-4/IL-10 co-treatment during gestation normalizes blood pressure and endothelial function in mice. Besides, IL-4/IL-10 co-treatment also had the most beneficial effect on foetal development and renal functions as well as decreased the levels of pro-inflammatory cytokines like IL-6, IFN- $\gamma$  and TNF $\alpha$ <sup>8</sup>.



4. **IUGR and GDM:** Increase in levels of TNF $\alpha$  is related to the risk of developing obstetric complications, particularly preeclampsia<sup>9</sup> and gestational diabetes mellitus<sup>10</sup> and IUGR<sup>11</sup>.
5. Neural Development of fetus: Stress in pregnancy also effects the neural development of the child in later life. Neurodevelopment outcomes of the child are substantiated through a process known as fetal programming. It causes increased vulnerability to schizophrenia in child of mother exposed to extreme stress in first trimester<sup>12</sup>. Maternal stress causes an increase in IL-6 concentrations which is associated with variation in front limbic white matter and cognitive development in early life<sup>13</sup>. Child of mother exposed antenatal to stress has an increased tendency of having autism and schizophrenia.

## Conclusion

Thus we come to an inference that stress has an important effect on continuation of pregnancy and complications related to it. Stress is responsible for increased number of infertile couples in this modern era. Stress may cause recurrent miscarriages and pre-term deliveries. Propensity of complications like PIH, GDM and IUGR also increase. Besides this, the neurological development of the baby in later life is also effected by antenatal stress. Stress relieving measures should be incorporated on daily basis in our lives like healthy nutritious food, family support, daily exercise and meditation. Medication for severe stressful conditions hampering a female's life should be timely provided.

## References

1. Y. Lu, M. Liu, S. Shi et al. (2010) Effects of Stress in Early Life on Immune Functions in Rats with Asthma and Effects of Music Therapy, *Journal of Asthma*, vol. 47, no. 5, pp. 526-531,
2. H.L. Wong, G.L. Costa, M.T. Lotze, S.M. Wahl et al. (1993) Interleukin (IL) 4 Differentially Regulates the Monocyte IL-1 Family Gene Expression and Synthesis in Vitro and Vivo", *The Journal of Experimental Medicine*, vol. 177, no. 3, pp. 775-78.
3. Michael Maes, Cai Song, Aihua Lin, Raf De Jongh, An Van Gastel, Gunter Kenis, Eugene Bosmans, et al. (1998) The effect of Psychological stress on Humans: Increased production of pro-inflammatory cytokines and Th-1 like response in stress induced anxiety. *Cytokine*. Volume 10, Issue 4, 313-318.
4. Lakatos E, Szigeti J.F., Ujma PP., Senty R., Balog P. (2012) Anxiety and Depression among Infertile Females: A Cross sectional survey from Hungary. *BMC Women Health*, 17(1); 48.
5. Hanna N, Hanna I, Hleb M, Wagner E, Dougherty J, Balkundi D, et al. (2000) Gestational Age Dependent Expression of IL-10 and its Receptor in Human Placental Tissues and isolated cytotrophoblasts. *J Immunol*. 164(11): 5721-810.4049/jimmunol.164.11.5721
6. Ziganshina MM, Krechetova LV, Vanko LV, Nikolaeva MA, Khodzaeva ZS, Sukhikh GT. (2013) Time course of the cytokine during the early pd. of normal pregnancy and its pts. with a history of habitual miscarriages. *Bull Exp Biol Med*. 154(3): 385-710.
7. Jonsson Y, Ruber M, Mattheisen L, Berg G, Nieminen K, Sharma S, et al. (2006) Cytokine mapping of sera from women with preeclampsia and normal pregnancies. *J Reprod Immunol*. 70(1-2): 83-9110.1016/j.jri.2005.10.007.
8. Chatterjee P, Chaisson VL, Seerangan G, Tobin RP, Kopriva SE, Newell-Rogers MR, et al. (2014) Combined treatment with IL-10 and IL-4 modulated immune cells and prevent hypertension in pregnant mice. *Am J hyper tens?* 10.1093/ajh/hpu100.
9. J.C. Paracoli, M.V.C Rudge and MTS Peracoli et al. (2007) Tumour necrosis factor-alpha in gestation and puerperium of ♀ with gestational hypertension and preeclampsia. *American Journal of Reproductive Immunology*, vol. 57, no. 3, pp. 177-185.
10. JP Kiriven, S Haugel-De Mouzon, J Lepereq et al. (2002) TNF- $\alpha$  is a predictor of insulin resistance in human pregnancy, *Diabetes*, vol. 51, no. 7, and pp. 2207-2213.
11. G Holeberg, M Huliehel, O Sapir et al. (2001) Increased production of tumour necrosis factor- $\alpha$  (TNF- $\alpha$ ) by IUGR human placentae." *European Journal of Obstetrics and Gynaecology and Reproductive Biology*. Vol. 94, no. 1, pp. 69-72.
12. Khaskhan AS, Abel KM, McName R, Pedersen MG, Webb RT et al. (2008) Higher risk of offspring schizophrenia following antenatal maternal exposure to severe adverse life events. *Archives of General Psychiatry*. 65(2): 146-152.
13. Rasmussen JM, Graham AM, Entringen S, Gilmore JH, Styner M et al. (2019) Maternal IL-6 concentration during pregnancy is associated with frontolimbic white matter and cognitive development in early life. *Neuroimage*. 185: 825-835.