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The Contribution of *Oja* in Pregnancy with Special Reference to Immuno-Modulation

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Abstract: Pregnancy is one of the most significant stages in a woman's life. It refers to the time when a fetus develops inside a woman's uterus or womb. The gestation period lasts around 40 weeks from the beginning of the last menstrual period(LMP). Ayurved has mentioned a novel concept known as Oja. Oja is one of the most crucial component responsible for the up keep and nourishment of life. It is supposed to be in the heart and operates through out the entire body. Oja manages and oversees the body's whole operational system.

Different Acharyas have identified Oja as Sarvadhatu Sara (essence of all Dhatus), Shukravishesha(energy), Jeevashonita (blood), Prana (vital energy), Bala(strength), Shleshma(mucus), Jeeva(life),Ushma (warmth) and so on. They have also considered Oja as Upadhatu (sub tissue) and its Vikruta Avastha (disorder)is Mala. Ayurveda explains the significance of Oja in the process of fertilisation, implantation, growth and development of the fetus during pregnancy. We can reconcile the current concept of immuno - modulation in pregnancy with our ancient theory of Oja. According to contemporary science,the immune system plays an important role in the preservation of pregnancy.

Keywords: Oja, pregnancy and Immuno - modulation in pregnancy.

I. INTRODUCTION

The term "*Garbha"* refers to the living being inside the womb. According to *Ayurveda, Garbha* is created as a result of the interplay between *Shukra*(sperm*), Shonita*(ovum) and *Atma*(soul) in relation to *Shodasha Vikaras*(manifestations) and *Ashta Prakriti* (developers)for the formation of *Garbha*, other elements such as *Panchamahabhuta* viz . *Prithvi* (earth),*Jala* (water), *Agni or Teja* (fire),*Vayu* (air)) and *Akasha* (ether or space) six procreative factors (*Shad Garbhakara Bhavas*) as *Matrija* (maternal), *Pitrija* (paternal), *Atmaja* (soul), *Rasaja* (nutritional*), Satmyaja* (adoptability) and *Sattvaja* (psychological) and *Garbha Sambhava Samagri* viz. *Ritu* (conception period), *Kshetra* (uterus), *Ambu* (nutritional circulation through blood), and *Beeja* (sperm and ovum) are also necessary.

In Ayurveda, there is a concept called *Oja* which refers to an entity that unites the body, mind, sensory organs, and soul in a state of harmonious functioning. *Oja* is believed to maintain accountability between life and death. There are two types of *Oja* viz . *Para*, and *Apara Oja*, which are explained in Ayurvedic texts. *Para Oja* is the primary form of *Oja* formed during an individual's intra-uterine life. It is located in the heart and is not impacted by straight forward physiological aberrations. On the other hand *Apara Oja* is formed by food and produced as end product after the formation of seven *Dhatus* viz . *Rasa* – (nutritious part of food that reaches blood from gut), *Rakta* (blood tissue), *Mamsa* (muscle tissue*), Meda* (fatty tissue),*Asthi* (bony tissue),*Majja* (bone marrow) *Shukra* (sperm) This type of *Oja* is influencable by etiological and medical conditions. This type of *"Oja"* is influenced by various factors such as diseases and other underlying causes. It is about half the size of an *Anjali*(‘Anjali Pramana ’is the unit of measurement of the liquid *Dhatus* in the body) *Oja* is regarded by some Acharyas as "*Rasa Sneha*" and "*Sarvadhatusara*"(optimum nutritional essence).

Our ancient texts have cited multiple sources that explain the role of *Oja* in processes like fecundity, implantation, growth, and development, involving factors such as *Prana*(life), *Bala*(strength) *Shukravishesha* (energy, *Shleshma* (mucus) *Jeevashonita, Teja*(glow), *Ushma* (Heat), etc. Similarly, the idea of immunology during pregnancy is explained by contemporary science. There is an immunological paradox in a successful pregnancy.

A foetus is one tissue that is frequently transplanted and tolerated during pregnancy, according to basic immunology. The immune system's enigmatic process keeps the foetus from being rejected and functions as an antigenically unnatural entity to expectant women. A more thorough discussion of the immune modulation mechanism is provided, along with an explanation of the *Oja* principles found in our classics.

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II. LITERATURE REVIEW

A. Oja and Garbha Utpatti

The concept of *Oja* and *Garbha Utpatti* is mentioned in Charak Samhita, the ancient text authored by *Acharya Charaka*. *Oja* signifies the beginning of the formation of the embryo, which is referred to as *Garbha*. The *Sharira Rasa* provides nourishment to the *Garbha* and enables it to take the position in the *Hridaya* (heart). According to *Acharya Chakrapani*, the formation of *Garbha* begins during the *Shukra Shonita Samyoga* and forms the *Garbha Jeeva* (life). *Garbha Poshan Rasa* (foetal circulation) provides nutrition to the foetus and inevitably forms the *Oja* also. *Oja* helps to maintain the *Garbha* throughout pregnancy period. Since the *Acharyas* have described the *Sthana* (abode) of *Para Oja* in *Hridaya* .It is supreme type of *Oja* which is most important for survival of life . Its quantity is supposed to be *Ashta Bindu* (eight drops). Another type of *Oja*, *Apara Oja* is circulated all over the body*(Sarva Sharir Vapi*) through arteries. *Apara Oja* is also developed during foetal stage. It is supposed that in eighth month of pregnancy this *Apara Oja* moves from foetus to mother and mother to foetus. *Apara Oja* which is circulated all over the body is *Ardhanjali(*half handful*)* in quantity. *Apara Oja is important for growth and development .Shukravishesha (*optimum end product of nutrition*)*supports *Oja* in development of *Garbha.*

B. Oja and Panchamahabhuta

As per traditional Indian philosophy, the physical body is made up of *Panchamahabhuta viz Prithvi (*earth) , *Jala(*water) *,Agni or Teja(* fire*),Vayu* (air *) and Akasha (*ether or space*).* Each *Mahabhuta* has a specific role in the development of the *Garbha*. *Jala Mahabhuta* resides in the body in all forms of fluid substances (*Shleshma, Rasa, Shukra* etc.). It provides functional strength to the sensory organs and keeps the fetus alive by nourishing the *Oja, Dhatus* and moisturizing the dryness caused by *Vayu* and *Agni.*

As per *Acharyas,* the state of *Oja* in *Vikrita Avastha* is considered as disorder (*Mala Avastha*). However, its natural state, known as *Prakrita Avastha* or *Shleshma,* provides strength *(Bala).* Further more, there are references regarding *Oja* in classical literature, such as *Rasa Sneha, Sapthadhatu Sara, Shukra Vishesha* etc. These allusions highlight the importance of *Jala,* which is the main component required to maintain *Oja* during pregnancy.

C. Oja and Shadbhavas

The combination of *Matrijadi Bhavas* and other pro-creative elements produce embryo. According to *Acharyas, Rasaja Bhava* (nutritional factor)is the cause factor of various bodily developments such as *Abhinivritti (*constitutional) *Abhivriddhi (*growth*),* *Prananubandha(*Bonding of life*), Tripti* (contenment*) Pushti(*nourishment*)* and *Utsaha(*passion*).* In *Garbha, Satmyaja Bhava* plays a vital role in the development of *Ayu, Arogya, Analasya* (enthusiasm), *Oja, Bala(strength), Medha(intellect)* and other bodily aspects. Our ancient texts mention "*Oja*" as *Prana* and *Bala*, which transmit T*ushti* and *Pushti* to the *Sharir(Body).* Since the roles of *Rasaja* and *Satmyaja* (adaptability factor) *Bhavas* are comparable to those of *Oja*, we can consider both these *Bhavas* as having a role in the development of *Oja* in *Garbha.*

D. Garbhavriddhi and Oja

During gestation, the substance known as *Oja* plays a vital role in the embryogenesis, organogenesis and subsequent growth and development of the developing fetus. The *Acharyas* have explained month-by-month development of the *Garbha (Masanumasika Garbha Vridhi*) in detail .But there are a few references available regarding *Oja.* The *Bala, Varna* and *Oja* in the *Garbha are* formed during the sixth month. Almost every Acharya has emphasized the significance of *Oja* in the eighth month.

To summarise: during the eighth month of pregnancy, the fetus remains immature which causes *"Oja"* to remain unstable and transmit between the mother and the fetus. As a result, the fetus experiences alternating moods that range from despair to excitement. Due to these factors, the eighth month is typically considered an inappropriate time for childbirth.

E. Oja and Garbhaposhana

As soon as the embryo develops, the mother starts nourishing it with *Ahara Rasa* and *Vayu* helps in its growth. According to all the *Acharyas,* there are two ways to comprehend *Garbha Poshana.*

1) Before *Apara Nirmana* by *Upasneha* and *Upasweda(*histio-trophic nutrition*)*

2) After *Apara Nirmana* (placenta formation) by *Nabhi Nadi(*umblical cord*)*

The consumption of *Ahara Rasa* by a mother not only nourishes herself but also provides nourishment to the fetus. The placenta is related to the uteroplacental circulation and the *Nabhi Nadi* connects the *Nabhi* of the fetus to the feto-placental circulation, circulating the *Ahara Rasa* absorbed by the mother. The nourishment of the fetus is done by *Siras* which impart *Rasa, Bala* and *Varna* to the fetus.

The exchange of blood between the mother, placenta, and fetus is known as *Rasa, Saptadhatusara* and *Jeeva Shonita* in this context. *Ahara Rasa* ultimately feeds *Garbha.*

F. Oja and Garbhini Paricharya

Our *Acharyas* have described various this applications of Ayurveda drugs viz.*Hridyam(*cardio tonics*), Madhuram (*carbohydrates*), Snigdham(fats), Drava(*liquid), *Deepaneeya(*appetiser) *Samskrita (*refiner*), Jeevaneeya(energizers) Gana Dravyas(*drugs*)*and *Samanya* (general) and *Vishesha (*specific) in *Garbhini Paricharya* (pregnancy guidelines) in their texts. These include *Navaneeta(Butter), Ghrita (*refined butter*), Ksheera*(milk), *Santarpana Ahara* (rich food or meal) and so on. In the *Ojokshaya Chikitsa (*Immuno-deficiency*),* these are mentioned as containing *Madhura Rasa, Sheeta Virya* and *Madhura Vipaka*, which are attributes of *Oja*. There are various *Viharas* that can aid in pregnancy-related *Oja* production and maintenance, such as *Abhyanaga, Mala Dharana,, Chandrika Snana, Kasturi Chandana* and more. Additionally, *Oushadi Dravyas(Drugs)* such as *Gokskura (Tribulus terrestris), Vidarikanda(Pueraria tuberosa), Kadali(Musa paradisiaca), Draksha(Vitis vinifera), Dhatri(Emblica officinalis), Panasa(Artocarpus heterophyllus), Kushmaanda(Benincasa hispida), Kharjura(Phoenix dactylifera), Bala(Sida cordifolia), Jeevaniya* (energetic*)* and *Garbhasthapaka* (pro pregnancy*) Gana Dravyas* can also aid in the process.

G. Immunology in Pregnancy

Pregnancy is a unique situation where the immune system behaves paradoxically. During pregnancy, the foetus and the mother's uterus interact with each other in various ways to support the healthy growth and development of the foetus. The placenta and foetus rely on different immune system cells and chemicals to function properly.

H. Immuno-genicity of Decidua

During pregnancy, the trophoblast invades a large area of a woman's body, including the inner third of the myometrium and the endometrium. To prepare for implantation, establishment, and support, the uterus undergoes significant remodelling that involves numerous cellular compartments. Decidualization is a cyclical process that begins in the mid-luteal phase of the menstrual cycle in humans. In the early stages of pregnancy, uterine NK cells account for over 70% of decidual leukocytes, with macrophages being the second most common at around 20%. T-cells make up 10-20% of decidual leukocytes, while B cells and dendritic cells (DCs) are less common.

I. Uterine NK Cells

Natural killer (NK) cells are a type of lymphocytes that are believed to originate in the bone marrow. Uterine NK (uNK) cells are a specific type of NK cells that are present in large numbers in the decidua during early pregnancy, mainly at the site of implantation. However, by the time of delivery, the number of uNK cells in the decidua decreases significantly. The infiltration of uNK cells is increased by progesterone, IL15, and decidual prolactin. These cells are weakly cytotoxic and do not typically kill trophoblast cells. Instead, uNK cells are an essential source of immunoregulatory cytokines, matrix metalloproteinases (MMPs), and angiogenic factors. These various factors play a crucial role in remodeling the extracellular matrix, trophoblast invasion, and angiogenesis, which are critical processes in placentation and the establishment of early pregnancy at the maternal-fetal interface. There is a high proportion of uNK cells in fetal circulation at 13 weeks of gestation. Given their high numbers, early presence and ability to kill cells, NK cells are likely vital components of the fetal innate immune system.

J. Macrophages

In the first trimester, decidual macrophages make up approximately 20% of the human decidual leukocyte population, indicating their relative abundance. The majority of macrophages at the maternal-fetal interface in a typical pregnancy belong to the M2 (immuno modulatory) phenotype. Existing macrophages contribute to early spiral artery remodelling by generating factors linked to tissue remodelling (MMP-9) and angiogenesis decidua prior to the formation of extravillous trophoblast (vascular endothelial growth factor [VEGF]).

K. Immuno- genicity of Trophoblast: Human Leukocyte Antigens

Human leukocyte antigens (HLAs) are similar to the major histocompatibility complex (MHC) found in humans. During pregnancy, the fetal membranes express tolerogenic HLAs rather than immunogenic ones, and the proteins expressed at the maternal-fetal interface are strictly regulated. There are two classes of MHC antigens: MHC class I and MHC class II.

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The MHC class I genes are divided into two subcategories: class Ia (classic) and class Ib (nonclassic). HLA-A, B, and C fall under class Ia, while HLA-E, F, and G fall under class Ib. MHC class II (HLA-D) genes are not translated in human trophoblast cells. Extravillous cytotrophoblasts, which are human trophoblast cells, express one MHC class Ia (HLA-C) and all MHC class Ib molecules. Most cells in the human body express MHC Class Ia, which is a "badge" that identifies "self" and provides protection against immune responses. However, fetal trophoblast cells in the human placenta do not express MHC class Ia (HLA-A and B) molecules, which are responsible for rejecting allografts in humans. Interactions between class I genes and decidual NK cells lead to the infiltration of trophoblasts into maternal tissues.

III. DISCUSSION

During pregnancy, both ancient classics and modern theories emphasize the importance of *Oja* and immunology, respectively, for sustenance and maintenance. Failure of implantation, embryogenesis, growth and development of the fetus or termination of pregnancy can occur due to the malfunctioning of the immune system or *Oja.* In the first trimester, the function of *Oja* in *Garbha Utpatti* is similar to the immune genicity of decidua and trophoblast. During the second trimester, there is rapid growth and development of the fetus and nutrients taken by the mother nourish the fetus initially through *Upasneha* and *Upasweda*, and later through *Apara-Garbha-Nabhi Nadi*. *Apara oja* is generated due to the excellence of seven *Dhatus* and is nourished by food. Small deviations may lead to disease conditions like anaemia, HTN(Hypertension) GDM(Gestational diabetes mellitus), repeated infections, etc., in the mother and IUGR(Intra uterine growth restriction), fetal insufficiency, etc., in the fetus. Usually, *Para Oja* is not affected by the deviation in physiology, but if it is affected, there may be chances of IUD(Intra uterine death) or stillborn. Therefore, it is essential to provide *Priya-Hitakara Ahara* and Vihara to both *Garbha* and *Garbhini* to safeguard from *Garbhopaghtakara Bhavas.* By the end of the third trimester, complete fetal development is seen. In the eighth month, instability of *Oja* is observed, and this can lead to complications of prematurity and preterm delivery of fetuses like birth asphyxia, RDS(Respiratory Distress Syndrome), IVH(Intra Ventricular haemorrhage), recurrent infections, etc. Improper management of these complications may cause fetal death. Thus, Acharyas have stated that the eighth month is unfit for delivery. The baby continues to mature during this month, adding to fat stores and experiencing a rapid development of the brain. The baby becomes able to see at this stage and begins to kick more. Most of the internal organs and systems get fully developed, but the lungs still need time to mature. By month 8 baby becomes close to 18 inches long. The fetus becomes able to identity most stimuli. Most of the internal systems become well-developed, but the lungs still remain immature.

IV. CONCLUSION

In this study an Analysis of *Oja* in relation to immuno- modulatory regulation during pregnancy has been attempted.

• Immuno-modulation occurs physiologically throughout pregnancy.

•*Oja* plays a crucial role in fertilization, implantation and development of the fetus during intra uterine life.

•*Ayurvedic* practices mentioned in *Garbhini Paricharya (*pregnancy guidelines) maintain *Oja* in the mother and fetus during pregnancy.

•*Rasayana* treatment feeds *Oja* and yields excellence in *Dhatus*. Immunity is increased by an increase in *Oja (Bala*). Numerous studies have demonstrated the immuno-modulatory effects of the medications used in *Rasayana* therapy. *Lehana* assists in boosting immunity as well in order to attain good quality *Oja (Vyadhikshamatva-Bala*) immunity.

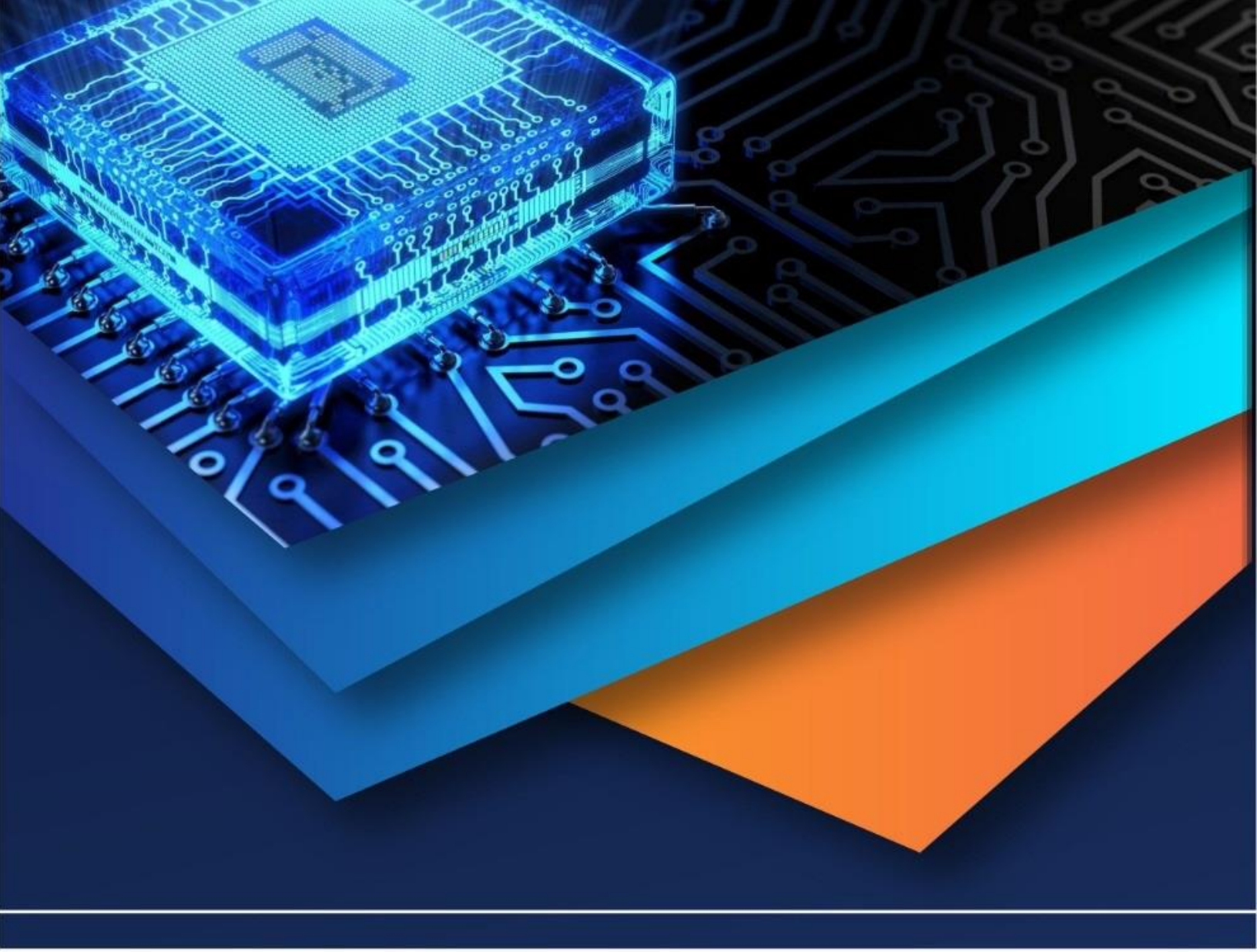
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