



Review Article

SCIENTIFIC ANALYSIS OF *GARBHINI AHAR* AS EPIGENETICS MODIFIER OF OFFSPRING GENETICS - A CRITICAL REVIEW

Thakur Jyotsna^{1*}, Masand Sameet²

¹Assistant Professor, P.G. Dept. of Prasuti Tantra Evum Stree Roga, National Institute of Ayurveda, Jaipur.

²Reader, P.G. Dept of Ras shahstra and Bhaishjya Kalpana, V.Y.D.S. Ayurveda Mahavidyalya, Khurja, U.P, India.

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ABSTRACT

Reproduction is a bliss that aids in transferring genes from one generation to another. Every prospective parent desire procreation of progeny endowed with supreme health throughout whole life. But, in today's era due to faulty dietary and lifestyle habits people are not paying attention to their health resulting in rising incidence of chronic health related hazards like, NCD, DM, HTN, Dyslipidemia, allergies in later life. In last few decades, growing number of epidemiological studies provide evidence for association between nutrition during intrauterine life and major risk factors for CVS disorders and metabolic syndrome in adult life known as fetal origin of adult disease. The notion that intrauterine environmental factors can reset physiological parameters and the resetting can endure into adulthood and can even affect the following generation is known as fetal programming. Ayurveda is far advanced as the concept of *Garbhini paricharya* particularly concept of month wise dietary regime is highly scientific and practical in terms of modern scientific knowledge. On screening the dietary articles mentioned for pregnant lady, it was found that every single fact pertaining to maternal diet mentioned in Ayurvedic text is scientific and has potential to modify the genome/phenotypic expression. Although these ancient dietary approaches have been successfully practiced from millennia but in present era elucidation of these approaches will improve the fidelity of Ayurvedic antenatal care as well as pave the way for future disease prevention. By focusing on *Garbhini swasthavritta* (pregnancy diet and lifestyle regimens) mentioned in Ayurveda we can reprogram the epigenetic modifications associated with increased disease risk in later life. *Ghrita*, milk and honey are very essential component of diet during pregnancy and should be consumed regularly. These dietary guidelines should be inoculated into general public for future imprinting of our next generation.

INTRODUCTION

Reproduction is a bliss that aids in transferring genes from one generation to another. Every prospective parent desire procreation of progeny endowed with supreme health throughout whole life. But, in today's era due to faulty dietary and lifestyle habits people are not paying attention to their health resulting in rising incidence of chronic health related

hazards like, NCD, DM, HTN, Dyslipidemia, allergies in later life. In last few decades, growing number of epidemiological studies provide evidence for association between nutrition during intrauterine life and major risk factors for CVS disorders and metabolic syndrome in adult life known as fetal origin of adult disease or Barker's hypothesis^[1]. As per this Hypothesis, environmental factors particularly nutrition act in early life to program the risk for adverse health outcomes in later life. Studies have proved that perinatal period is most critical period for future maternal and child health, wellbeing, immunity and disease manifestation in later life^[2]. Keeping this in mind, during late ninth century, a noble concept of epigenetics came into existence and postulated that environmental components especially nutrients can

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produce changes in genome activity including trans generational alterations in phenotype. The notion that intrauterine environmental factors can reset physiological parameters and the resetting can endure into adulthood and can even affect the following generation is known as fetal programming. Thus, more and more emphasis is being given to maternal diet during pregnancy and fetal nutritional programming of chronic disease is progressively attracting more attention in health and development circles. On the other hand, Ayurveda, our scientific system of medicine has accepted thousands of years ago that our body is product of food (*Ahar*) and food has been compared to (*Prana*) vital force required for sustenance and vitality of individuals. Similarly, great emphasis has been given to safe motherhood and meticulous description of *Garbhini ahar* (maternal dietetics) is available in our text for imparting supreme health to upcoming progeny. Ayurveda is far advanced as the concept of *Garbhini paricharya* particularly concept of month wise dietary regime is highly scientific and practical in terms of modern scientific knowledge. On screening the dietary articles mentioned for pregnant lady, it was found that every single fact pertaining to maternal diet mentioned in Ayurvedic text is scientific and has potential to modify the genome/phenotypic expression. Although these ancient dietary approaches have been successfully practiced from millennia but in present era elucidation of these approaches will improve the fidelity of Ayurvedic antenatal care as well as pave the way for future disease prevention. So, Present paper will deal with critical analysis of ancient concept of maternal dietetics on modern scientific parameters and set framework for nutritional transition or reprogramming to have healthy progeny.

AIM AND OBJECTIVES

- Scientific analysis of *Garbhini ahar* for getting supreme healthy progeny.
- To create awareness regarding maternal diet during pregnancy.
- To inoculate these approaches into antenatal nutritional guidelines for creating healthy progeny.
- To impart strong adaptive immunity to upcoming generations.
- To make it globally acceptable preventive approach.

Concept of *Garbhini Ahar* in Ayurveda

In Ayurveda, *Garbhini Ahar* is one of the most impactful factors on child health and development. Systemic supervision and care including diet, code and conducts of daily living along with perfect advice is known as *Garbhini paricharya* in Ayurveda. It is an unique concept in Ayurveda designed to fulfill four main intentions i.e, *Anupghataya* (delivery without

complication), *Paripuranaatavaya* (for optimum fetal growth and development), *Sukhprasavaya* (for easy and safe delivery) and *Arogyabalavarnasamhanan sampat apatya jannaya* (for getting progeny with excellence in health, immunity, complexion and constitution)^[3]. For fulfilling these intentions, special month-wise dietary regime has been mentioned along with routine care. As per Ayurveda, *Garbha* is amalgamation of six procreative factors called *Shadgarbhkarabhava* and consortium of these factors is very important for a healthy offspring^[4]. Out of these six factors, *Rasaj bhava* (ultra-essence part of digested food called *rasa*) is of utmost importance because of its role in nurturing the *Sookshambhoota* in *Garbh sharira* and later on affects the structure and functioning of tissue or organ system developed from that *Bhautik tatva*. Acharya Charak has also highlighted the role of *Kalagarbhashayaprakriti* (intrauterine environment) and *Maturaharvihar prakriti* (Maternal dietary and lifestyle habits) as a main factors for formation of *Garbha deha-prakriti* (physio-psychological constitution of fetus) leading to different phenotypic expressions of individuals^[5]. As per this concept of *Garbha prakriti*, diet and lifestyle adopted by mother during pregnancy is definitely going to influence the *Prakriti* (physical and psychological constitution) of *Garbha*. Thus, *Ahara* can be considered as utmost influential factor for growth and development during prenatal life as well as essential for future imprinting of good health and longevity. It is best supplement of nutrition as well as greatest form of medicine for pregnant lady. On critical analysis of the food articles indicated for pregnant lady, It was found that Almost all sages have emphasized to use *Dravam* (liquid), *Hridya* (palatable), *Madhurpraya* (sweet), *Deepniya* (appetizer/easily digestible) and *Snigdha* (unctuous) substances during pregnancy^[6]. *Ksheera* (milk), *Ghrita* (clarified butter), *Madhu* (honey), *Navneetam* (fresh butter) have been mentioned just like nectar throughout the pregnancy. *Astanghridayakara* has mentioned to use good amount of butter, *Ghrita* and milk on regular basis^[7]. Acharya Kashyapa has mentioned *Mansarasa* (meat soup) as *Paramaousadh* (great medicine) for growth and development of foetus^[8]. As per Yogratnakara, pregnant lady has been directed to use *Satmaya* and *Laghu ahara* specially *Shali*, *Shastika rice* (*Oryza sativa*), *Mudag* (*Phaseolus mungo*), *Godhuma* (*Triticum sativum*), *Madhur dadhi* (sweetened curd), fruits like *Dhatri* (*Emblica officinalis*), *Draksha* (*Vitis vinifera*), *Kadli* (musap) for optimum nourishment as well as growth and development of fetus^[9].

DISCUSSION

Gestation is most vulnerable period for optimum fetal growth and development and focus on maternal diet during this period is of utmost importance. Intake of nutrient dense diet, healthy lifestyle modifications, stress reduction therapies, avoidance of toxic substances is very essential for the health of unborn child. Nowadays, intrauterine fetal reprogramming is major area of concern to prevent the onset of fetal origin of diseases of adulthood. Scarce nutrient supply (*Maturaharviharpakriti*) and increased oxidative stress (*Kalagarbhashaya prakriti*) during intrauterine environment are major factors responsible for expression of hybrid receptors resulting in subsequent development of metabolic disorders in adult life^[10].

Nowadays, it is most widely studied concept known as epigenetics and involves alterations or external modifications to DNA that turns genes on or off without any alteration in DNA sequence. Epigenetic mechanisms utilize a variety of strategies to regulate gene expression generally through DNA Methylation or histone modification or through non-coding RNA's^[11]. In general, these changes are brought about mainly by nutrients like macronutrients, micronutrients, microminerals and dietary polyphenols supply, environmental factors like pollutants, radiation exposure, stress and exercise. Thus, diet plays major role during pregnancy by regulating the genetic expression either by altering the normal epigenetic states or by reversal of abnormal gene activation. Keeping in view specific dietary regimens mentioned in *Garbhini paricharya*, analysis of given food items was done and it was found that each and every dietary article has ability to modify genetic expression thereby imparts strong immunity to fetus and prevents from metabolic disorders of adulthood. Milk is rich source of folic acid and folate present in milk is highly bioavailable due to the presence of folate binding protein (FBP). Folate is key element in methyl metabolism pathway. Dietary deficiency of folate can alter hepatic DNA methylation patterns, causes insulin resistance, changes in methylation related to RAS system and forms basis for onset of HTN, DM, carcinoma in adult life^[12].

Milk also contains extracellular vesicles that contain wide range of micro-RNA's and control 40-60% of total gene expression and play role in immune T-regulatory cell development^[13]. Medicated milk has also been advised by all Acharya specially medicated with *Madhur verga* drugs having rich polyphenol content. Polyphenols are potent antioxidant molecules having the potential of modifying offspring genetics. Main emphasis has been given on taking *Ghrita* (clarified butter) and *Navneeta* (butter) in daily diet

and on screening the *Navneeta* on modern parameters it was found that, it is an ample source of Butyric acid which is a small chain fatty acid (SCFA) having ability of modifying histone by inhibiting histone deacetylase thus brings about healthy epigenetic changes in offspring^[14]. *Ghrita* is also valuable source of polyunsaturated fatty acids specially omega-3 fatty acids and maternal supplementation with omega-3 fatty acids is associated with changes in histone acetylation patterns at T-cell differentiation regulating genes thereby prevents from allergic diseases in later life^[15].

Ghrita is also high in Conjugated Linoleic Acid (CLA) having potent anti-carcinogenic, anti-allergic and anti-inflammatory properties thereby prevents from non-communicable diseases of adulthood. Likewise, *Shali Shasthika* rice (red rice) and *Mudag* are rich in dietary fibers and on fermentation of these dietary fibers, butyrate is produced by gut bacteria which is a potent epigenetic modifier. Shali rice is also good source of Zn and studies have proved that Zn levels play essential role in DNA methylation during intrauterine life and its deficiency may contribute to alteration in promoter methylation resulting in immune dysregulation^[16]. Honey has been mentioned as very important constituent of monthly diet regimens. It is an excellent therapeutic agent along with high nutritional content. As per studies, honey contains 30 types of polyphenols mainly flavonoids and phenolic acids responsible for inhibiting oxidation which confers corresponding anti-inflammatory effect by inhibiting the production of NO. Eugenol and chrysin present in honey possess to have anti-tumour activity. Kaempferol present in honey protects against accumulation of LDL thereby reduces the risk of major chronic diseases^[17].

Acharya have also advised to take curd during fourth and fifth month of pregnancy. Scientists have proved that formation of Gut microbiota occurs in intrauterine life and development of GIT tract is completed by 12-14 weeks. Intestinal microbiota strongly influences maturation of immune system specially affect Th1/Th2 Treg. Cell balance and supplementation with probiotics during pregnancy modifies methylation of DNA particularly of obesity promoting genes and also prevents allergic diseases in offspring^[18]. As per a study conducted by Chen X et.al, in pregnant women, consumption of prebiotic yogurt has shown beneficial effects for mother and child^[19]. Thus, sweetened curd mentioned in *Garbhini paricharya* is natural probiotic as well as immunity enhancer. *Jangal mansarasa* i.e., lean meat advised in 4th and 5th month is rich source of choline and as per certain animal studies, maternal choline

supplementation during pregnancy modifies histone and methylation of DNA in fetal liver and brain^[20].

Gokshur sidh yavagu has been mentioned during sixth month of pregnancy. *Gokshur* contains Kaempferol a natural antioxidant^[21] and studies have shown an inverse relationship between kaempferol intake and cancer by modulation of cellular signal transduction pathways linked to apoptosis, angiogenesis, inflammation and metastasis^[22]. Fruits advised like *Draksha* (raisins), *Aamlaki* (*Embllica officinalis*) contain ample amount of polyphenols having potent antioxidant property thereby perform free radical scavenging activity and prevent emergence of various diseases in later life.

CONCLUSION

Ayurveda, a far advanced science mainly emphasizes on maintenance, promotion of preventive and positive health through diet and lifestyle not only after birth but right from the pre-conceptional period throughout pregnancy to whole life. Intrauterine life nutrition forms basis for susceptibility to plethora of chronic age related non-communicable diseases. Specific dietary regime mentioned for pregnant lady is highly scientific and practical in terms of modern medical science and is efficient to bring healthy epigenetic modifications in offspring. Thus, by focusing on *Garbhini swasthavritta* (pregnancy diet and lifestyle regimens) mentioned in Ayurveda we can reprogram the epigenetic modifications associated with increased disease risk in later life. *Ghruta*, milk and honey are very essential component of diet during pregnancy and should be consumed regularly. These dietary guidelines should be inoculated into general public for future imprinting of our next generation. Thus, it can be concluded that this fetal programming paradigm provides good opportunity for Ayurveda scholars to prioritize the *Garbhini paricharya* regimen against the known factors to bring healthy epigenetic changes in upcoming offspring and ensure favorable health outcome for future generation.

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***Address for correspondence**

Dr. Thakur Jyotsna

Assistant Professor

P.G. Dept of Prasuti Tantra Evum

Stree Roga,

National Institute of Ayurveda,

Jaipur, Rajasthan.

Email:

thakurjyotsna16@gmail.com

Mobile: 8219232403

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