Garbhasanskar and Epigenetics: Ancient Wisdom Meets Modern Molecular Science

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ABSTRACT

Background: *Garbhasanskar* or *Garbha Samskara* is described in contemporary Ayurvedic literature as a prenatal care framework centred on maternal diet, conduct, emotional state, and environment during pregnancy.

Aim and objectives: To review the available literature on *Garbhasanskar* and examine its conceptual relationship with epigenetic mechanisms involved in fetal programming.

Materials and methods: A narrative review was prepared using integrative articles on *Garbha Samskara* together with reviews on prenatal stress, maternal nutrition, antenatal mental health, and developmental epigenetics.

Results: The most consistent overlap between *Garbhasanskar* and modern developmental science concerns maternal nutrition, psychological well-being, mind-body practices, and supportive social surroundings during pregnancy. These domains are relevant to fetal programming through endocrine, inflammatory, placental, and epigenetic pathways.

Conclusion: *Garbhasanskar* may be interpreted as a culturally rooted prenatal health model that is biologically plausible in light of modern fetal programming research, although direct clinical and molecular validation of the complete Ayurvedic model is still limited.

Keywords: Garbhasanskar, Epigenetics, fetal programming, maternal nutrition, prenatal stress, mantra therapy.

INTRODUCTION

Long before the discovery of DNA, Ayurvedic physicians held that the character, intellect, and constitution of a child were shaped not merely at the moment of conception but continuously through the months the fetus spent in the womb. This body of prenatal practice is known as *Garbhasanskar,* a term formed from *Garbha* (the developing fetus) and *Sanskar* (the impressions, refinements, and habitual tendencies that mould character). A structured *Garbhasanskar* course has been described as encompassing fetal growth across the nine months, learned behaviour and belief systems, mental programming, communication with the fetus, music and sensory stimulation, and nutritional management as linked domains of care.[1] Classical texts such as the *Charaka Samhita* and *Sushruta Samhita* prescribed month-wise regimens of diet, herbal support, sensory stimulation, mantra recitation, and emotional regulation for the pregnant woman, on the premise that whatever she ate, felt, and perceived was transmitted to the child she carried.

Two thousand years later, molecular biology arrived at a parallel insight through an entirely different route. The discipline of epigenetics demonstrated that gene expression can be switched on or off by chemical modifications to DNA and its associated proteins, without any alteration of the underlying genetic code, and that these

modifications can be induced by nutrition, stress, and environmental exposure during sensitive developmental windows. When this molecular evidence is read alongside the Developmental Origins of Health and Disease (DOHaD) hypothesis, first proposed by Barker after he linked low birth weight to adult cardiovascular disease,[2] a coherent picture emerged that the intrauterine period is not a passive incubation phase but an active period of biological "programming" with consequences that persist into adulthood and, in some cases, across generations.

This review examines the conceptual overlap between *Garbhasanskar* and epigenetics. It surveys the evidence on five pathways through which the maternal state is thought to influence the fetus and future progeny — nutrition, food behaviour and flavour learning, psychological stress, mantra-based sound and breath practice, and environmental/toxicant exposure — with a view to situating a traditional system of care within a contemporary mechanistic framework.

MATERIALS AND METHODS

This study is a narrative review of published literature relevant to *Garbhasanskar* and prenatal epigenetics. The source base included integrative Ayurvedic reviews, biomedical reviews on prenatal stress and maternal nutrition, and international guidance documents on antenatal care and perinatal mental health.

RESULTS

Garbhasanskar: The Classical Framework

Ayurveda organises antenatal care under two linked constructs: *Garbhadhan Sanskar*, preconception preparation of both parents beginning roughly three months before conception, and *Garbhini Paricharya*, a planned, month-by-month regimen of diet, lifestyle, and medical supervision through pregnancy.[1] These classical prescriptions cover fetal growth, learned behaviour, visualisation, reading, communication with the fetus (*Garbha Samvad*), music, sensory stimulation, *yoga* and *pranayama,* nutrition, and meditation as ten linked domains through which the mother is believed to influence the unborn child.[1] Underpinning these practices is the doctrine of *Masanumasika Paricharya*, month-specific therapeutic and dietary guidance corresponding to the sequential formation of bodily tissues *Rasa, Rakta, Mamsa, Meda, Asthi, Majja,* and *Shukra*) through gestation.[1]

Central to the Ayurvedic model is the idea that the mother's *Manas* (mind) and *Ahara* (diet) are not merely her own but are shared with the fetus through a continuous physiological and psychological conduit. Anger, fear, grief, or malnutrition experienced by the mother are held to leave an imprint on the child's temperament and constitution. In contrast, a calm mind, a nourished body, and positive engagement are held to favour robust fetal development. Notably, Ayurveda also possessed an ancient Theory of Heredity distinct from environmental influence. *Acharya Charaka* described three units of inheritance, *Beeja* (germ cell), *Beejbhaga* (chromosome), and *Beejbhagavayava* (gene), and attributed congenital anomalies to defects in these units — a framework contemporary Ayurvedic scholars read as an early, non-molecular anticipation of the distinction between genetic inheritance and the modifiable expression of that inheritance.[3]

Epigenetics: The Modern Framework

Epigenetics is the study of mitotically and, in some cases, meiotically heritable changes in gene function that occur without a change in the DNA sequence itself. The principal molecular mechanisms are DNA methylation at cytosine residues, post-translational modification of histone proteins that alters chromatin accessibility, and regulation by non-coding RNAs such as microRNAs. These marks determine which genes in a given cell are transcriptionally active, and they are laid down and revised most extensively during two windows of heightened plasticity, i.e., gametogenesis and early embryonic/fetal development. It is this developmental sensitivity that gives the intrauterine period its outsized influence on lifelong phenotype.

The DOHaD framework, building on Barker's original epidemiological observations linking low birth weight to adult ischaemic heart disease,[2] formalised the idea that early-life exposures have a lasting impact on long-term health, with fetal programming influencing tissue function, metabolism, and organ structural development. A landmark evidence for an epigenetic mechanism underlying this programming came from the Dutch Hunger

Winter cohort: adults who had been exposed to acute famine in utero during 1944–45 showed measurably reduced DNA methylation of the imprinted *IGF2* gene six decades later compared with their unexposed same-sex siblings. This association was strongest for exposure during the periconceptional period.[4] Subsequent work on the same cohort extended this finding to additional differentially methylated regions within the *IGF2/H19* locus, confirming that early gestational exposure leaves a durable, locus-specific epigenetic signature independent of later genetic variation.[5]

Where the Two Frameworks Converge

The conceptual overlap between *Garbhasanskar* and Epigenetics is not merely rhetorical. Both systems reject the idea that the fetus's future is fixed at conception; both hold that maternal diet, behaviour, mental state, and surrounding environment act as modifiable inputs during a bounded developmental window; and both propose that the effects of this input persist well beyond birth, shaping constitution, temperament, and disease susceptibility across the lifespan. *Garbha Samskara* has been framed explicitly as an antenatal-care system and a preventive measure against adverse epigenetic change, positioning structured maternal practice during pregnancy as an applied means of favourably shaping the fetal epigenome.[1] The related scholars of Ayurveda have proposed that the Ayurvedic construct of *Prakriti* — the constitutional type established at conception and expressed throughout life — maps conceptually onto the modern distinction between a fixed genotype and a variable, environmentally responsive phenotype, identifying lifestyle and behaviour, diet, stress, and environment as major levers of that variation in both traditions.[6,3]

This convergence should be read as a correspondence in structure and emphasis rather than as literal molecular equivalence. Ayurvedic texts speak in the language of *dosha*, *dhatu*, and *sanskar*; epigenetics speaks in the language of methyl marks, histone acetylation, and transcription factor binding. What the two share is the underlying causal architecture: an environmentally sensitive intermediate layer, sitting between the fixed genetic endowment of the child and its eventual phenotype, that is open to modification by maternal behaviour during a defined developmental period. Framed this way, *Garbhasanskar* can be read as a centuries-old, experience-derived protocol for managing exactly the variables that epigenetic science has since shown to matter, without any claim that the ancient physicians who devised it understood, or needed to understand, DNA methylation.

Maternal Nutrition and the Fetal Epigenome

Nutrition is the pathway with the deepest evidentiary base connecting maternal state to fetal epigenetic outcome. One-carbon metabolism — the biochemical pathway through which folate, vitamin B12, choline, methionine, and betaine supply methyl groups for DNA methylation — is the best-characterised mechanistic link between diet and the epigenome.[7] The Dutch Hunger Winter data provide the clearest human evidence that maternal caloric and micronutrient restriction during a discrete gestational window produces a measurable, persistent epigenetic mark, specifically hypomethylation of the *IGF2* differentially methylated region, with the association being specific to periconceptional exposure.[4] This literature lends direct empirical support to the emphasis *Garbhasanskar* places on *Masanumasika Paricharya*, the month-wise dietary regimen intended to match maternal nutrition to the tissue-formation priorities of each gestational stage.[1] Where Ayurveda specified particular foods, herbal drugs, and preparations for each month largely on empirical and doctrinal grounds, the epigenetic literature supplies a plausible molecular rationale: nutrient availability at specific developmental windows determines methyl-donor supply to a genome that is, at that moment, laying down marks it will carry for life.

Maternal Food Behaviour, Flavour Learning, and Programming of Progeny Eating Patterns

Beyond nutrient composition, the mother's food *behaviour* — what, how much, and how she eats shapes the sensory and behavioural environment the fetus experiences, with consequences that extend well beyond birth. From roughly the third trimester onward, the human fetus is capable of chemosensory perception, and flavour compounds from the maternal diet are transmitted directly into the amniotic fluid that the fetus swallows. A landmark controlled study demonstrated that infants whose mothers had repeatedly consumed a specific flavour in late pregnancy showed significantly greater acceptance and enjoyment of that same flavour at weaning than infants without such prenatal exposure, establishing that dietary flavour learning begins in utero rather than after

birth.[8] A systematic review commissioned by the United States Department of Agriculture, synthesising evidence across eleven studies of pregnancy and fifteen studies of lactation, concluded that flavours such as alcohol, anise, carrot, and garlic reliably transfer from the maternal diet to amniotic fluid and breast milk, and that fetal and early postnatal exposure to these flavours increases a child's later acceptance of similarly flavoured foods.[9]

Maternal food behaviour also programmes offspring appetite and food preference through mechanisms that go beyond simple sensory learning. [10] Read together, this literature indicates that the mother's food choices and eating pattern during pregnancy do not merely supply nutrients; they actively instruct the developing fetus's sensory expectations and appetitive drives, a finding that resonates closely with the Ayurvedic conviction that *ahara* consumed by the mother is experienced by, and leaves a lasting impression upon, the child she carries. The *Garbhasanskar* emphasises wholesome, S*attvic*, and consciously chosen maternal food behaviour — as distinct from mere caloric or nutrient adequacy — is therefore consistent with a growing evidence base on prenatal flavour learning and appetite programming, even though the Ayurvedic prescription long precedes the chemosensory and metabolic evidence now available to explain it.

Maternal Stress and Fetal Epigenetic Programming

Ayurveda placed comparable weight on the pregnant woman's mental and emotional state, prescribing *Garbha Samvad*, meditation, and the deliberate cultivation of calm and positive affect as core components of *Garbhasanskar*.[1] Modern research on the hypothalamic-pituitary-adrenal (HPA) axis offers a biologically specific counterpart to this prescription. The glucocorticoid receptor gene, *NR3C1*, is a principal target of stress-related epigenetic regulation: prenatal maternal psychosocial stress and depressed or anxious mood have repeatedly been associated with altered methylation at the *NR3C1* promoter region in cord blood and neonatal tissue, with downstream effects on infant cortisol reactivity. A meta-analysis pooling data from nearly a thousand mother-infant pairs across multiple cohorts found a statistically significant, if modest, correlation between prenatal stress exposure and methylation at a specific CpG site within this promoter region.[11] An earlier study similarly reported that elevated third-trimester maternal depressive or anxious mood predicted increased *NR3C1* methylation at a regulatory transcription-factor binding site, which in turn predicted heightened cortisol stress responses in the infant at three months of age.[12]

The consequences of prenatal maternal stress for progeny extend well beyond the neonatal period and beyond a single gene locus. Using serial fetal magnetic resonance imaging in a cohort of ninety-seven mother-infant dyads, elevated maternal psychological distress during pregnancy was found to be associated with altered fetal hippocampal volume and cortical folding; this altered brain development, in turn, was associated with lower infant cognitive scores and reduced social-emotional competence at eighteen months of age, indicating that maternal distress measurably shapes the structural trajectory of the fetal brain well before birth.[13] A broader review of the neurobiological literature on prenatal stress and autism spectrum disorder has similarly proposed that severe or sustained maternal stress during critical windows of gestation may elevate offspring risk for atypical neurodevelopment, acting through combined effects on maternal cortisol, placental function, and fetal HPA-axis programming.[14]

These findings echo, in molecular and structural terms, the classical Ayurvedic claim that a mother's emotional perceptions during pregnancy are transmitted to the fetus and shape its subsequent temperament, cognition, and stress reactivity. The HPA axis, sensitised in utero by maternal glucocorticoid exposure and its epigenetic consequences, provides a plausible biological substrate through which this transmission could occur, lending a testable mechanism to what Ayurveda framed as a matter of *Sanskar*, or impression, upon the developing being.

Mantra Recitation and the Fetal Environment: An Emerging Evidence Base

Among the specific practices prescribed within *Garbhasanskar, mantra* recitation occupies a distinctive place. Classical texts describe month- and stage-specific *mantras* and *Shlokas*, such as the *Garbha Raksha Stotra*, chanted by the mother with the stated aim of stabilising her mind, nourishing the *Sukshma Sharira* (subtle body) of the fetus, and shaping the child's character. Contemporary interpretation situates this practice within *Daiva*

Vyapasraya Chikitsa, the Ayurvedic category of spiritually mediated therapeutics applied to conditions of pregnancy and the puerperium that are not fully addressed by physical measures alone.

A 2025 systematic review examined the physiological and psychological evidence for mantra-based intervention on feto-maternal wellbeing, describing mantra chanting as a vibrational, rhythmic-breath practice with plausible neuroendocrine effects.[15] The review reported that contemporary studies correlate mantra recitation with modulation of the HPA axis, promotion of parasympathetic tone, and reduction of circulating cortisol, changes that are relevant given the established association between elevated maternal cortisol and adverse outcomes such as intrauterine growth restriction, preterm labour, and neurodevelopmental delay.[15] Individual studies pooled within this review reported reductions in maternal systolic blood pressure, decreased anxiety, and improved sleep quality among pregnant women receiving mantra-based interventions. However, the review noted that most of these studies combined mantra chanting with adjunct practices such as *Pranayama,* making it difficult to isolate the effect of recitation alone, and that much of the supporting evidence relies on subjective or self-reported measures rather than biomarker data.[15]

The physiological plausibility of these effects is supported by foundational research outside the obstetric literature. A controlled comparative study published in the *BMJ* found that reciting the rosary or a yoga mantra at a rate of approximately six repetitions per minute — corresponding to a breathing rate of six breaths per minute — produced striking, synchronous increases in cardiovascular rhythms and a significant increase in baroreflex sensitivity in healthy adults, an autonomic pattern associated with cardiovascular health and vagal tone.[16] Applied to pregnancy, this body of evidence suggests a coherent, testable mechanism: rhythmic mantra recitation, through slowed and regularised breathing, may reduce maternal sympathetic arousal and circulating stress hormones, thereby moderating the same maternal glucocorticoid and HPA-axis signalling pathways implicated in the *NR3C1* methylation changes discussed above.[11,12]

Taken together, this literature positions *mantra* recitation as a biologically plausible, low-cost component of *Garbhasanskar* whose proposed mechanism of action — autonomic and neuroendocrine modulation converging on the same maternal stress pathways that influence fetal epigenetic programming — is consistent with, though not yet directly demonstrated by, the epigenetic evidence on prenatal stress. The authors of the 2025 systematic review explicitly concluded that while mantra therapy holds promising theoretical value for feto-maternal health, robust randomised controlled trials incorporating physiological and molecular biomarkers are still needed to validate its therapeutic efficacy.[15]

Environmental Exposure and the Fetal Epigenome

Beyond diet, food behaviour, stress, and sound-based practice, Ayurveda's concept of *Garbhopaghatkara Bhava* — factors injurious to the fetus, encompassing unwholesome environment, harmful substances, and adverse physical conditions — anticipates the pathway examined by contemporary developmental epigenetics through environmental toxicant exposure.[1] Animal models have demonstrated that in utero exposure to endocrine-disrupting chemicals and other environmental agents can alter DNA methylation at metastable epialleles, loci whose methylation state is established stochastically in early development and is unusually sensitive to environmental perturbation.[7]

DISCUSSION

Reading *Garbhasanskar* through the lens of epigenetics is intellectually productive, but the correspondence should be stated carefully. Ayurvedic texts were not derived from, and do not require validation by, molecular biology; their internal logic rests on doctrines of *dosha, dhatu*, and consciousness that are independent of the DNA-methylation framework used here as an interpretive bridge. Much of the literature explicitly proposing this bridge — including several of the reviews cited above — originates from Ayurveda studies seeking contemporary scientific grounding for traditional antenatal practice, and should be read as a hypothesis-generating synthesis rather than as demonstrated causal equivalence. Direct molecular studies testing whether specific *Garbhasanskar* practices, including mantra recitation and prescribed food behaviour, produce measurable, reproducible changes in offspring methylation are still scarce, and the mantra literature itself remains limited by small samples, self-reported outcomes, and a lack of biomarker endpoints.[15]

Even with this caveat, the practical convergence is meaningful for antenatal care. Both frameworks converge on a small set of modifiable maternal variables — nutritional adequacy, conscious food behaviour, psychological calm, rhythmic breath and sound practice, and avoidance of harmful exposures — during a bounded and biologically sensitive period. Given that DOHaD research identifies the periconceptional and early gestational windows as particularly consequential for durable epigenetic marks,[4,5] structured antenatal programmes that begin before conception, as *Garbhadhan Sanskar* prescribes, may be better aligned with the underlying biology than antenatal care that begins only once pregnancy is confirmed. This suggests a translational opportunity: *Garbhasanskar-like* structured antenatal programmes, adapted and tested with contemporary methodology, could serve as a low-cost, culturally embedded vehicle for delivering exactly the nutritional, behavioural, psychological, autonomic, and environmental safeguards that epigenetic and neurophysiological science identify as protective.

CONCLUSION

Garbhasanskar and epigenetics arrive at a shared conclusion from independent traditions of inquiry: that the intrauterine period is a formative window during which maternal nutrition, food behaviour, emotional state, sound and breath practice, and environmental exposure shape the offspring's constitution in ways that persist long after birth. The molecular and physiological evidence — from the Dutch Hunger Winter cohort's altered *IGF2* methylation, to prenatal flavour learning and junk-food-induced appetite programming in offspring, to glucocorticoid receptor changes and altered fetal brain development linked with prenatal maternal stress, to autonomic effects of mantra recitation on maternal cardiovascular and stress physiology — gives the classical Ayurvedic practices a plausible mechanistic underpinning. In contrast, the classical framework offers a structured, holistic template for translating these principles into practicable maternal care. Future research combining rigorous molecular and physiological endpoints with structured *Garbhasanskar* interventions, including dietary behaviour counselling and *mantra*-based practice, would help determine whether this conceptual convergence can be turned into a validated, integrative model of prenatal care.

Author Contributions

Both the authors contributed to the conception, literature review, drafting, and critical revision of this manuscript, and approved the final version for submission.

Conflicts of interest

The authors declare no conflicts of interest relevant to this review.

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