WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
Coden USA: WJPRAP Impact Factor 8.63
Volume 15, Issue 7, 1774-1785. Research Article ISSN 2277–7105

GURUGATRATVA AND MATERNAL–FETAL ADAPTATION: AN OBSERVATIONAL STUDY OF ANATOMICO-PHYSIOLOGICAL CHANGES DURING THE FOURTH MONTH OF PREGNANCY IN GARBHINI

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Article Received on 05 March 2026,
Article Revised on 25 March 2026,
Article Published on 04 April 2026,

https://doi.org/10.5281/zenodo.19437232

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How to cite this Article: Dr. Ranapariya Radhika Dineshbhai[1*], Dr. Divya Nidhi[2] (2026). Gurugatratva And Maternal–Fetal Adaptation: An Observational Study Of Anatomico-Physiological Changes During The Fourth Month Of Pregnancy In Garbhini. World Journal of Pharmaceutical Research, 15(7), 1774–1785.
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ABSTRACT

Background: Ayurveda describes the fourth month of pregnancy as the stage of *Garbha Sthiratva* (fetal stabilization) and *Gurugatratva* (subjective and objective heaviness of the mother). Classical descriptions closely resemble modern accounts of early second-trimester maternal and fetal adaptations, yet this equivalence has been only sparsely quantified. **Aim:** To document anatomico-physiological changes during the 4th month of pregnancy in *Garbhini* women and correlate the Ayurvedic concept of *Gurugatratva* with contemporary obstetric parameters. **Methods:** An observational cross-sectional study was conducted on 50 pregnant women (13–16 weeks gestation) attending the antenatal clinic of a tertiary Ayurvedic hospital. Demographic data, Ayurvedic subjective parameters (e.g. *Gurugatrata*, *Stanau-pinatva*, *Dauhridayavastha*, *Lomaraji Udaagam*), modern clinical parameters (breast changes, per-abdominal findings), vital signs, anthropometry, lipid profile, complete blood count, and fetal biometry were recorded using a pre-tested proforma. Data were analyzed using descriptive statistics, Chi-square tests and paired t-tests ($p < 0.05$ significant). **Results:** Most participants were 25–29 years (64%), literate (94%), urban (62%), middle-class (74%), housewives (86%) and primigravida (64%), indicating Ayurveda uptake among young,

educated, urban women. *Gurugatrata* increased from 18% in the 3rd month to 78% in the 4th month (χ^2 = 36.06, p < 0.001). *Stanau-pinatva* (46%→74%, p = 0.004) and *Lomaraji Udaagam* (0%→12%, p = 0.012) also showed significant rise, while *Sphuran, Dauhridayavastha* and *Sakthisadan* increased modestly without statistical significance. Breast changes—size, visible veins and secondary areola/Montgomery tubercles—showed highly significant increments (p < 0.05), whereas colostrum appeared in a small subset. Fundal height was palpable above the symphysis pubis in 92% of women in the 4th month. Systolic blood pressure, pulse rate, maternal weight and BMI increased significantly from 3rd to 4th month (p < 0.01), while diastolic blood pressure and respiratory rate remained within physiological limits. Lipid profile showed physiological hyperlipidemia, CBC demonstrated mild hemodilutional anaemia with normal RBC, platelets and mild leukocytosis, and fetal biometry (BPD, HC, AC, FL, estimated fetal weight ~107 g) was appropriate for gestational age. **Conclusion:** The study demonstrates that *Gurugatratva* is a composite clinical marker reflecting objectively measurable maternal weight gain, cardiovascular adaptation, breast and cutaneous changes, and normal fetal growth in the 4th month. These findings substantiate that classical Ayurvedic descriptions of *Garbha Sthiratva* and *Gurugatratva* closely parallel modern second-trimester physiology, supporting an integrative, evidence-informed model of antenatal care.

KEYWORDS: Ayurveda; *Garbhini*; *Gurugatratva*; *Garbha Sthiratva*; pregnancy; fetal development; physiological changes; maternal adaptation.

INTRODUCTION

Pregnancy is a complex physiological state characterized by coordinated anatomical, cardiovascular, metabolic and endocrine adaptations that support fetal growth and prepare the mother for childbirth and lactation.[1,3,5] Modern obstetrics describes the early second trimester (13–16 weeks) as a period of stabilization following organogenesis, with expansionof plasma volume, increased cardiac output, uterine enlargement beyond the pelvic brim and progressive breast changes.(PubMed)

Ayurveda views pregnancy (*Garbhavastha*) as a sacred, highly regulated state in which the woman (*Garbhini*) requires specialized diet, behaviour and medical care. Classical texts describe month-wise (*Māsānumāsika*) fetal development and maternal changes. In Charaka Saṃhitā, the fourth month is designated as the stage of *Garbha Sthiratva* (structural

stabilization of the fetus) and *Gurugatratva*, where the mother experiences distinct heaviness and weight gain as the *Garbha* becomes more solid and firmly established:
"Chaturthe māsi sthiratvam āpadyate garbhaḥ; tasmāt tadā garbhiṇī gurugātratvam adhikam āpadyate viśeṣeṇa." (C.S. Śārīra 4/20).[2]

Chakrapāṇi, in his commentary, interprets *sthiratva* as *nibiḍatva* (compactness), explaining that as the fetus becomes more dense and heavy, the mother naturally experiences *Gurugatratva*.[2] This concept implicitly encompasses fetal stabilization, placental maturation and maternal systemic adaptation.

Contemporary embryology divides intrauterine development into pre-embryonic, embryonic and fetal phases; by the beginning of the fetal period (week 9 onwards), organ primordia are formed and subsequent growth primarily involves increase in size, maturation and functional refinement.[3,4] (NCBI) Around 13–16 weeks, the placenta is fully functional, maternal circulation has adapted to increased volume load and the uterus becomes palpable above the symphysis pubis, aligning closely with the Ayurvedic concept of *Garbha Sthiratva* and onset of *Gurugatratva*.[1,5] (PMC)

Despite these conceptual parallels, quantitative clinical data that explicitly correlate *Gurugatratva* and related Ayurvedic parameters with modern obstetric measurements are limited. The present study, derived from an MD (Ay) dissertation, attempts to bridge this gap by systematically documenting 3rd–4th month changes in *Garbhini* women and examining the extent to which *Gurugatratva* reflects objectively measurable maternal and fetal parameters.

MATERIALS AND METHODS

Study Design and Setting

This was an observational, cross-sectional descriptive study conducted in the OPD of *Prasūti Tantra evam Strī Roga* at State Ayurvedic College & Hospital, Lucknow, Uttar Pradesh, India. The total study duration was 18 months, encompassing protocol development, ethical approval, data collection, analysis and documentation.

Study Population and Sample Size

Pregnant women attending routine antenatal check-ups during their 4th month of gestation (13–16 weeks by last menstrual period) were screened. A total of 50 Garbhini fulfilling the inclusion criteria were recruited.

Inclusion criteria

- Age 25–35 years
- Confirmed singleton intrauterine pregnancy (13–16 weeks)
- Clinically healthy *Garbhini*
- Preferably primigravida

Exclusion criteria

- Age <25 or >35 years
- History or presence of chronic systemic disorders (hypertension, diabetes, thyroid disease, tuberculosis, renal disease, etc.)
- Congenital anomalies or known genetic disorders
- Pregnancy with systemic infection or inflammatory conditions
- Non-consenting participants

Data Collection Tools

A pre-designed, pre-tested proforma was used, incorporating: demographic data; detailed obstetric history; Ayurvedic subjective parameters; modern clinical parameters; vital signs; anthropometry; laboratory investigations; and ultrasound fetal biometry.

Ayurvedic subjective parameters (3rd vs 4th month)

- *Gurugatrata* (sense of heaviness)
- *Sphuran* (early fetal movements)
- *Stanau-pinatva* (fullness/engorgement of breasts)
- *Sakthisadan* (lassitude in thighs)
- *Dauhridayavastha* (specific desires, cravings, emotional sensitivity)
- *Stan-chuchuk/Stanmandala Krishṇatā* (areolar/nipple pigmentation)
- *Pādaswayathu* (pedal edema)
- *Lomaraji Udaagam* (midline abdominal hair/linea nigra)

Modern clinical parameters

- Breast changes: size, visible superficial veins, discharge (colostrum), secondary areola/Montgomery tubercles.
- Per-abdominal assessment: fundal height, abdominal girth, presence of striae gravidarum, linea nigra

Objective parameters

- Vital data: systolic and diastolic blood pressure (SBP, DBP), pulse rate (PR), respiratory rate (RR)
- Anthropometry: height, weight, BMI
- Lipid profile: total cholesterol, triglycerides, HDL, LDL
- Complete blood count (CBC): Hb, RBC, WBC, PCV, platelets
- Fetal biometry (USG): biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), femur length (FL), estimated fetal weight

Analog weighing machine, stadiometer, sphygmomanometer, clinical thermometer and measuring tape were used following standard procedures.

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethics Committee of State Ayurvedic College, Lucknow, prior to data collection. Written informed consent was taken from all participants, and confidentiality was maintained throughout the study.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS and GraphPad Prism. Descriptive statistics (mean, SD, percentages) were used for all variables. Chi-square tests assessed categorical changes between 3rd and 4th month; paired t-tests compared continuous variables. A p-value < 0.05 was considered statistically significant.

RESULTS

Demographic Profile

Among 50 *Garbhini*, most were 25–29 years (64%), Hindu (56%), urban residents (62%) and literate (94%). Middle-class socio-economic status predominated (74%); 60% consumed a mixed diet and 86% were housewives. Primigravida constituted 64% of the sample.

This profile indicates that young, educated, urban middle-class women with first pregnancies were more likely to access Ayurvedic antenatal services in the study setting.

Ayurvedic Subjective Parameters

- **Gurugatrata:** Present in 9 women (18.0%) in the 3rd month, increasing to 39 (78.0%) in the 4th month ($\chi^2 = 36.06$, $p < 0.001$).
- **Stanau-pinatva:** Present in 23 (46.0%) vs 37 (74.0%) in 3rd vs 4th month respectively ($\chi^2 = 8.17$, $p = 0.004$).
- **Lomaraji Udaagam:** Absent in all women in the 3rd month; present in 6 (12.0%) in the 4th month ($\chi^2 = 6.38$, $p = 0.012$).
- **Dauhridayavastha:** Increased from 14 (28.0%) to 20 (40.0%) ($p = 0.205$; non-significant).
- **Sakthisadan:** 9 (18.0%) to 10 (20.0%) ($p = 0.799$; non-significant).
- **Sphuran:** 0 to 3 cases (6.0%; $p = 0.079$; non-significant).
- **Stan-chuchuk/Stanmandala Krishṇatā:** 29 (58.0%) to 38 (76.0%) ($p = 0.205$; trend but non-significant).
- **Pādaswayathu:** 19 (38.0%) to 14 (28.0%) ($p = 0.288$; mild decrease).

Overall, *Gurugatrata*, *Stanau-pinatva* and *Lomaraji Udaagam* showed statistically significant increases between 3rd and 4th month, while other parameters displayed physiologically plausible but statistically non-significant trends.

Breast Changes

- **Breast size:** "Increased" responses rose from 18 (36.0%) in 3rd month to 37 (74.0%) in 4th month ($\chi^2 = 14.59$, $p < 0.001$).
- **Visible veins:** Present in 24 (48.0%) vs 34 (68.0%) ($\chi^2 = 4.11$, $p = 0.043$).
- **Colostrum discharge:** Seen in 2 (4.0%) vs 6 (12.0%) ($p = 0.140$; non-significant).
- **Secondary areola/Montgomery glands:** Present in 4 (8.0%) vs 38 (76.0%) ($\chi^2 = 47.45$, $p < 0.001$).

These findings highlight a marked 4th-month surge in structural and vascular breast changes with initial onset of secretory activity in a subset of women.

Per-Abdominal Findings (4th Month)

- Fundal height was palpable above the symphysis pubis in 46 women (92.0%).

- No measurable change in abdominal girth was observed in any case at this gestational window.
- Striae gravidarum were present in 12 (24.0%)—predominantly multigravida.
- Linea nigra was observed in 5 (10.0%).

Objective Parameters

Comparing 3rd vs 4th month values:

- **SBP:** 105.50 ± 13.40 → 114.42 ± 14.00 mmHg ($p = 0.003$)
- **DBP:** 72.38 ± 8.16 → 74.74 ± 8.89 mmHg ($p = 0.210$; NS)
- **PR:** 90.62 ± 7.78 → 96.98 ± 10.16 bpm ($p < 0.001$)
- **RR:** 18.44 ± 1.66 → 18.88 ± 2.00 /min ($p = 0.227$; NS)
- **Weight:** 51.44 ± 9.26 → 52.51 ± 9.06 kg (mean gain ≈ 1.07 kg; $p < 0.001$)
- **BMI:** 22.43 ± 2.55 → 22.94 ± 2.62 kg/m² ($p < 0.001$)

These changes signify early second-trimester cardiovascular adaptation and expected gestational weight gain within normal limits.

Lipid Profile (4th Month)

Mean values were: total cholesterol 235.11 ± 15.48 mg/dL, triglycerides 178.44 ± 27.29 mg/dL, HDL 60.38 ± 9.03 mg/dL, LDL 139.04 ± 9.86 mg/dL, consistent with physiological gestational hyperlipidemia.

Complete Blood Count (4th Month)

Mean Hb was 10.66 ± 0.99 g/dL (mild anaemia), with RBC 3.63 ± 0.37 million/cc, WBC 8.86 ± 1.38 ×10³/cc (mild leukocytosis), PCV 35.48 ± 2.14% and platelets 2.39 ± 0.47 million/cc—reflecting physiological haemodilution with otherwise acceptable haematological status.

Fetal Biometry (4th Month)

Mean fetal parameters were: BPD 26.26 ± 2.61 mm, HC 93.47 ± 11.35 mm, AC 76.65 ± 13.02 mm, FL 13.43 ± 3.05 mm and estimated fetal weight 107.08 ± 9.13 g, compatible with normal 13–16 week growth trajectories.[4,6] (NCBI)

DISCUSSION

Integrating Gurugatratva with Modern Physiological Changes

The most striking finding of this study is the significant rise in *Gurugatrata* from 18% to 78% between the 3rd and 4th month, alongside objective increases in maternal weight, BMI, SBP and PR. This supports the proposition that *Gurugatratva* is not merely a subjective sensation but a clinical surrogate for cumulative maternal–fetal mass, circulatory load and systemic adaptation.

Soma-Pillay et al. describe pregnancy as a hyperdynamic state with ~40% increase in cardiac output, 25–30% reduction in systemic vascular resistance and progressive expansion of blood volume, changes that begin early in gestation and peak around mid-pregnancy.[1,5] (PubMed) These hemodynamic alterations, combined with growth of the uterus, placenta, amniotic fluid, breasts, extracellular fluid and maternal fat stores, contribute to the gravitational and postural "heaviness" that Ayurveda encapsulates as *Gurugatratva*.

Ayurvedic descriptions explicitly link *Gurugatratva* to *Garbha Sthiratva* and placental nourishment; the fetus transitions from a loosely organized mass to a compact, "heavy" structure as organs complete differentiation and growth accelerates. This is congruent with modern embryological division of development into embryonic (organogenesis up to 8 weeks) and fetal (growth and maturation from week 9 onwards) phases.[3,4] (NCBI) By 13–16 weeks, fetal biometry in our cohort (BPD, HC, AC, FL, weight ~100 g) confirmed that structural stability and proportional growth had been achieved, providing a quantitative correlate to *Garbha Sthiratva*.

Breast Changes and Stanau-pinatva

The significant increase in *Stanau-pinatva* and the parallel modern breast findings—enlarged size, prominent superficial veins and development of secondary areola/Montgomery glands—underscore another key convergence between Ayurvedic and contemporary descriptions.

Modern literature attributes these changes to rising estrogen and progesterone, lobulo-alveolar proliferation, vascular engorgement and early initiation of lactogenesis I.[7–9] (PubMed) Alex et al. note that during pregnancy the areola darkens, breast volume increases and Montgomery glands become more prominent, preparing the breast for postnatal milk ejection.[7] (PubMed) Jozsa and Thistle describe colostrum secretion beginning as early as

12–16 weeks (lactogenesis I), even though full milk production is suppressed by high estrogen and progesterone until postpartum.[8] (NCBI)

In Ayurvedic language, *Stanau-pinatva* and *Stanavṛiddhi* reflect the same morpho-functional changes, interpreted through *Artavavaha Srotas* and *Mātrija Bhāva*. The high prevalence and statistical significance of these changes in our cohort affirm their reliability as 4th-month markers of physiological pregnancy.

Cutaneous and Linea Changes: Lomaraji Udaagam

The emergence of *Lomaraji Udaagam* (12.0% in 4th month) and modest occurrence of linea nigra (10%) mirror known skin changes of pregnancy, particularly midline hyperpigmentation and accentuation of abdominal hair. Clinically, linea nigra and increased hair along the midline are attributed to melanocyte stimulation by estrogen, progesterone and melanocyte-stimulating hormone.[6] (ijccm.org)

Ayurveda's qualitative language—"upright hair line" and "dark streak"— closely mirrors these observations and treats them as healthy signs accompanying *Gurugatratva* and *Garbha Vriddhi*.

Dauhridayavastha, Food Cravings and Maternal–Fetal Nutrition

Dauhridayavastha increased from 28% to 40%, though not statistically significant. Nevertheless, its presence aligns conceptually with modern observations that pregnancy is often accompanied by altered taste, aversions and specific cravings, possibly reflecting neuro-hormonal modulation and increased nutritional demands.[5,12] (ResearchGate)

Ayurveda characterizes *Dauhridaya* as the "two-hearted" state in which maternal and fetal desires are intertwined, suggesting that unfulfilled fetal nutritional needs may manifest as maternal cravings. This provides a culturally embedded explanatory model that can be leveraged to improve dietary counselling during pregnancy.

Cardiovascular, Hematological and Lipid Adaptations

The significant rise in SBP, PR, weight and BMI from 3rd to 4th month, with DBP and RR remaining within expected ranges, is consistent with cardiovascular adaptations described by Soma-Pillay et al. and other authors.[1,5,11] (PMC) Early peripheral vasodilatation and reduced systemic vascular resistance are compensated by increased stroke volume and heart rate, culminating in higher cardiac output and blood pressure in the early second trimester.[1,11]

Physiological hyperlipidemia observed in this study (elevated total cholesterol and triglycerides with adequate HDL) represents a well-recognized adaptation that ensures adequate substrate for placental steroidogenesis, fetal growth and maternal energy reserves.[1,5] (PMC) Mild anemia with preserved RBC indices and mild leukocytosis reflect hemodilution and immune adaptation during normal pregnancy.[1]

Ayurvedically, these systemic changes are encompassed under *Garbha Poṣaṇa* through *Āhāra Rasa*, mediated by *Apara* (placenta) and maternal *Rasa–Rakta Dhātu*; *Gurugatratva* thus becomes the outward expression of successful maternal–fetal nutritional dynamics.

Strengths and Novelty

- First, this study operationalizes classical Sanskrit constructs such as *Gurugatratva*, *Stanau-pinatva* and *Lomaraji Udaagam* as measurable clinical variables and statistically correlates them with modern parameters.
- Second, it provides a month-specific (3rd–4th) window into these changes, which is rarely addressed in detail in modern literature.
- Third, it demonstrates that the Ayurvedic description of the fourth month as a distinct transition phase is strongly supported by quantitative maternal and fetal data.

Limitations

- Single-centre study with modest sample size (n = 50), limiting generalizability.
- Cross-sectional 3rd–4th month comparison rather than longitudinal follow-up throughout pregnancy in each woman.
- Ayurvedic parameters relied on clinical judgement and subjective reporting, which may introduce observer and recall bias.
- Ultrasound and laboratory values were limited to routine parameters; advanced imaging or hormonal assays were not included.

Future Directions

Future multicentric, longitudinal studies with larger cohorts, integration of hormonal profiles (hCG, estrogen, progesterone, prolactin), doppler studies of uteroplacental circulation and more granular fetal assessment could further refine the mapping between *Gurugatratva*, *Garbha Sthiratva* and modern biomarkers. Incorporating validated questionnaires for *Dauhridayavastha* and fatigue (*Sakthisadan*) may also improve psychometric robustness.

CONCLUSION

The fourth month of pregnancy emerges as a distinct transitional stage in both Ayurvedic and modern frameworks. In this cohort of 50 *Garbhini*, there was a highly significant rise in *Gurugatrata*, breast fullness, midline cutaneous changes, maternal weight and cardiovascular parameters, alongside normal fetal biometric indices and physiological haematological and lipid adaptations.

These findings substantiate that:

1. **Gurugatratva** is a meaningful, clinically observable construct that encapsulates maternal weight gain, circulatory load, uterine and breast enlargement and fetal growth during the 4th month.
2. **Garbha Sthiratva**—the Ayurvedic notion of fetal stabilization—is quantitatively reflected in appropriate 13–16 week biometry and normal systemic adaptation.
3. **Ayurvedic and modern descriptions are deeply concordant**, differing primarily in language and conceptual framing rather than observed phenomena.

By empirically validating classical descriptions against contemporary obstetric data, this work supports a structurally integrated model of antenatal care where Ayurvedic month-wise understanding can complement modern risk assessment, counselling and monitoring.

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