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CORRELATION OF BIOCHEMICAL PARAMETERS AND AYURVEDIC HETUS IN KHALITYA (HAIR LOSS)

Dr. Darshana[1], Vd. Khandekar Ashwini Mangesh[2*]

[1]Guide, Associate Professor, Desh Bhagat University, Mandi, Gobindgarh.

[*2]PhD Scholar, Dept. of Roganidana Avam Vikruti Vigyan, Desh Bhagat University, Mandi, Gobindgarh.

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***Corresponding Author**

Vd. Khandekar Ashwini Mangesh

PhD Scholar, Dept. of Roganidana Avam Vikruti Vigyan, Desh Bhagat University, Mandi, Gobindgarh.

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ABSTRACT

Khalitya (hair loss) has increased across age groups, reflecting lifestyle shifts, dietary changes, environmental exposures, and psychosocial stress. Classical Ayurveda emphasizes etiological factors (Hetu) grounded in Nidana Panchaka and Trisutra, while modern biomedicine highlights micronutrient status and scalp ecology. This cross-sectional study of 40 participants diagnosed with Khalitya integrates classical hetus with biochemical parameters (serum calcium, phosphorus), aiming to identify predominant etiologies and explore correlations with mineral status. A validated questionnaire captured classical hetus by frequency grades; venous blood analysis measured serum calcium and phosphorus with standard colorimetric methods. Frequent hetus involved Viruddha Ahara, Lavana Rasa Atisevana, and Kshara Atisevana. Serum calcium was below reference in 55% of participants, while phosphorus remained normal in all. Findings support the Ayurvedic construct connecting Asthi Dhatu with hair physiology and underscore dietary incompatibilities and calcium insufficiency as clinically relevant. The study advocates an integrative prevention-first approach combining nidana parivarjana, nutrition correction, and scalp health practices, while recommending expanded biochemical profiling (vitamin D3, B12, ferritin) and larger cohorts.

KEYWORDS: Khalitya, Ayurveda, Hetu, Asthi Dhatu, Viruddha Ahara, Serum calcium, Phosphorus, Hair loss, Nidana Panchaka.

INTRODUCTION

Khalitya, described among Kshudraroga in classical texts, is traditionally linked to vitiation of Pitta and Vata, leading to follicular destabilization at the scalp and impaired nourishment to Kesha. Contemporary prevalence in younger demographics mirrors rapid transitions in food systems, urban stressors, exposure to pollutants, and heightened use of chemical hair treatments. Hair loss impacts self-image, social functioning, and quality of life, making it more than a cosmetic issue.

Ayurveda situates Khalitya within a robust etiological framework. The Trisutra (Hetu–Linga–Aushadha) centers causation before therapy, while Nidana Panchaka details the five pillars of disease understanding: Nidana (causes), Purvarupa (prodrome), Rupa (signs/symptoms), Samprapti (pathogenesis), and Upashaya (palliative tests). Hetu—especially dietary incompatibilities (Viruddha Ahara), excess Lavana (salt) and Kshara (alkaline substances), and psychosocial factors (Krodha, Shoka)—play a critical role. Kesha is classically associated with Asthi Dhatu; disturbances in dhatu metabolism and shrotas (microchannels) manifest as hair fragility, shedding, and delayed regrowth. Scalp hygiene and thermal exposures (excessive heating of hair) further modulate outcomes.

Modern trichology aligns partially with these constructs. Hair cycling (anagen, catagen, telogen) is sensitive to hormonal milieu, micronutrients, oxidative stress, and scalp microbiome balance. Calcium and phosphorus are central to skeletal health; calcium signaling also supports keratinocyte adhesion and follicular function. While phosphorus typically remains stable unless systemic disease is present, calcium insufficiency may co-occur with suboptimal vitamin D status, dietary patterns, or stress-linked endocrine changes. Environmental pollutants and cosmetic treatments introduce oxidative stress and shaft damage, compounding diffuse hair fall.

Despite numerous reports on micronutrients and hair physiology, integrative mappings of classical hetus with measurable biochemical panels are sparse. This study addresses that gap, identifying the most frequent Ayurvedic hetus in a real-world cohort and correlating them with serum calcium and phosphorus. We hypothesized that dietary hetus (Viruddha Ahara, excess Lavana, Kshara) would dominate and that calcium insufficiency would be common, supporting the Asthi Dhatu–Kesha linkage.

OBJECTIVES

- **Primary:** Identify predominant classical hetus in individuals with Khalitya.
- **Secondary:** Quantify serum calcium and phosphorus and explore their distribution vis-à-vis hetu profiles.
- **Exploratory:** Contextualize biochemical findings within Ayurvedic theory and preventive strategies.

MATERIALS AND METHODS

Study design and setting

- **Design:** Observational, cross-sectional.
- **Setting:** Outpatient Ayurveda clinic with laboratory access for biochemical testing.
- **Duration:** Single assessment per participant.

Participants and eligibility

- **Inclusion criteria:** Individuals aged 15–45 years, clinically diagnosed with hair fall consistent with Khalitya; willingness to provide informed consent and venous blood samples.
- **Exclusion criteria:** Systemic illness (e.g., renal, hepatic, endocrine disorders); known hormonal disorders; active dermatologic scalp infections; current medications affecting calcium/phosphorus metabolism (e.g., high-dose supplements, diuretics).

Diagnostic framework and hetu capture

- **Ayurvedic assessment:** Diagnosis per Nidana Panchaka with emphasis on Hetu (dietary incompatibilities, rasa atisevana, psychosocial factors, scalp care practices).
- **Questionnaire:** Structured instrument capturing:
  - **Dietary hetus:** Viruddha Ahara (e.g., fish + milk), Atisevana of Lavana and Kshara, excessively spicy/processed foods.
  - **Psychosocial hetus: Krodha:** anger/irritability; **Shoka:** grief; **Shrama:** exertion/fatigue.
  - **Lifestyle/scalp: Unclean scalp:** infrequent washing/residue; **Excessive heat:** blow-drying, hot water, heat styling.
  - **Other:** smoking; heredity/family pattern.
- **Validation:** Content review by two Ayurveda faculty; pilot tested in five participants for clarity and timing.

Biochemical analysis

- **Sample collection:** 3–5 mL venous blood under asepsis; serum separation per standard protocol.
- **Assays:** Colorimetric determination of serum calcium and phosphorus using laboratory-validated kits; internal quality controls run daily.
- **Reference ranges:** Standard adult laboratory ranges for calcium and phosphorus; clinical interpretation relative to lab-provided cutoffs.

Data management and statistics

- **Data capture:** Paper forms transcribed to electronic sheet; double entry checks for accuracy.
- **Analysis plan:** Descriptive statistics for demographics and hetus; frequency grading (Grade I rare; Grade II frequent; Grade III most frequent); mean ± standard error for biochemical parameters; proportions below/within reference ranges.
- **Ethics:** Institutional ethics committee approval; written informed consent; confidentiality maintained.

RESULTS

Demographics

Table 1. Age distribution of participants.

Age Group	Percentage
15–20	2.5%
21–25	10%
26–30	27.5%
31–35	22.5%
36–40	17.5%
41–45	20%

- **Pattern: Peak:** 26–30 years; **Substantial:** 31–35 years; **Stable:** 36–45 years with modest decline.
- **Interpretation:** Elevated prevalence in late twenties/early thirties aligns with lifestyle transitions, stress, and dietary shifts.

Additional demographics (narrative)

- **Gender: 80% male, 20% female.**
- **Occupation: 27.5% workers; 25% service; 20% students; 12.5% drivers; 10% farmers; 5% homemakers.**

- **Insight:** Work schedules and environmental exposures (heat, dust, pollutants) plausibly contribute to scalp stress and oxidative damage.

Hetus classification and frequency

Table 2. Hetus by frequency grade.

Grade	Hetus
Grade I (Rare)	Shoka, Shrama, Heredity, Smoking
Grade II (Frequent)	Krodha, Unclean scalp, Excessive heating of hair
Grade III (Most frequent)	Viruddha Ahara, Lavana Rasa Atisevana, Kshara Atisevana

- **Dominant hetus: Viruddha Ahara (85%), Lavana Atisevana (75%), Kshara Atisevana (62.5%).**
- **Supporting hetus:** Krodha, unclean scalp, excessive heat; lower prevalence of Shoka/Shrama and hereditary/smoking factors.
- **Interpretation:** Diet-centric nidana profiles strongly implicate Pitta aggravation and shrota dysfunction.

Biochemical parameters

Table 3. Serum calcium and phosphorus.

Parameter	Below normal	Normal	Mean ± SE
Serum calcium	55%	45%	9.06 ± 0.21 mg/dL
Serum phosphorus	0%	100%	3.59 ± 0.09 mg/dL

- **Key finding:** Calcium insufficiency in over half the cohort; phosphorus stability across all participants.
- **Interpretation:** Selective mineral involvement supports the Asthi Dhatu linkage and suggests dietary or endocrine contributors (vitamin D not measured here).

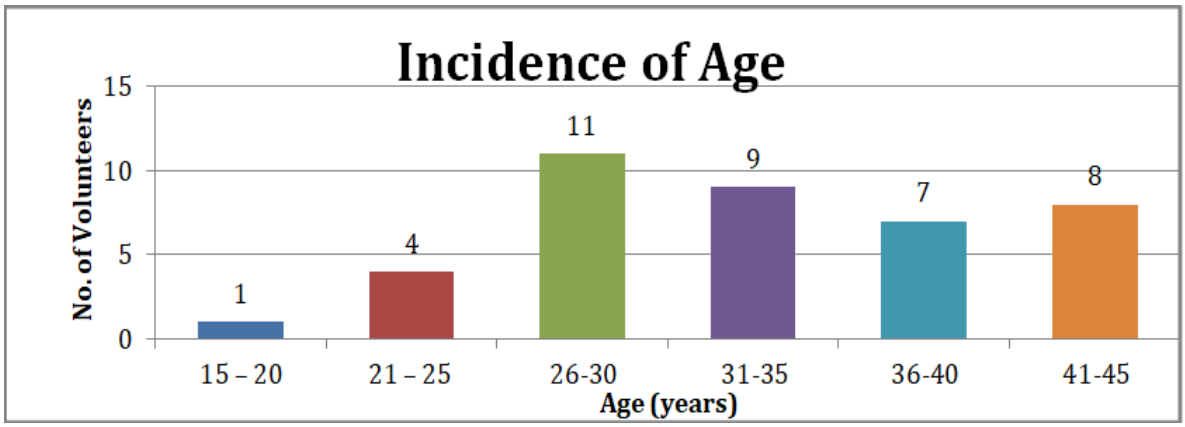


Figure 1: Age and gender distribution in Khalitya cohort.

Gender of the volunteers and its frequency

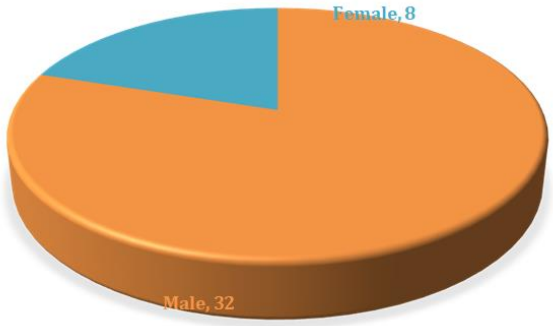


Figure 2: Frequency of classical hetus by grade.

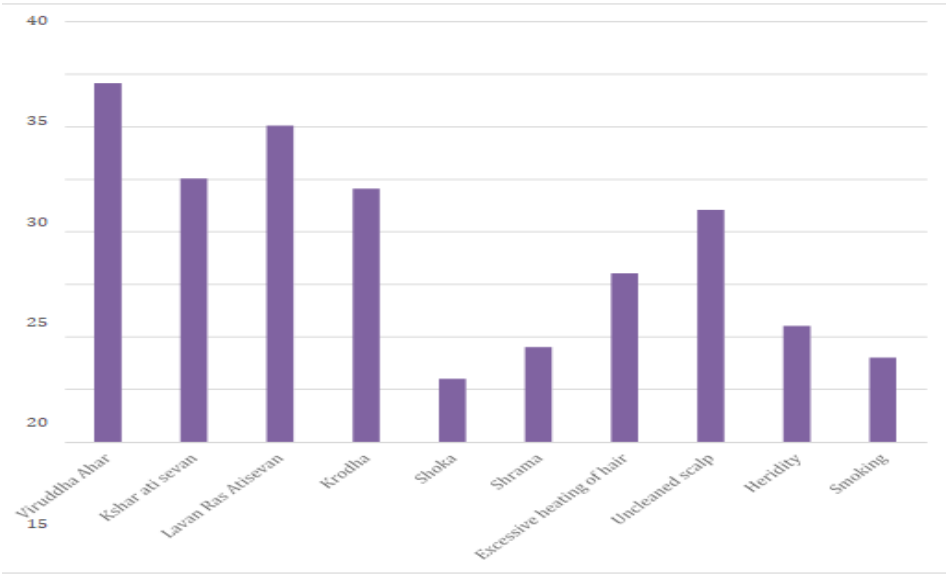
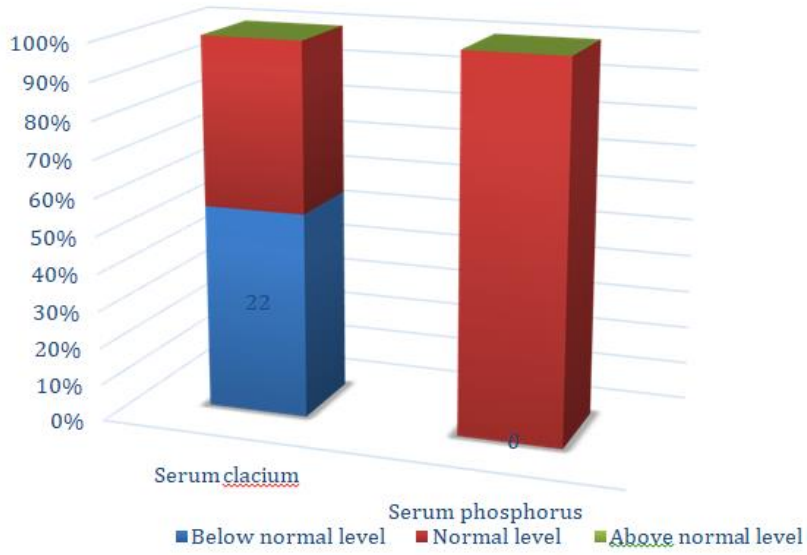


Figure 3: Serum calcium and phosphorus distributions with reference thresholds.



DISCUSSION

Integrating classical hetus with modern mechanisms

Dietary nidanas—Viruddha Ahara and excess intake of Lavana and Kshara—emerged as the most frequent contributors. Classical guidance on incompatible combinations (e.g., fish with milk, sour with dairy, fruit with milk) reflects digestive and metabolic discord, potentially increasing Pitta and disturbing shrotas. Excess salt and alkalis may aggravate Pitta and impair dhatu stability, aligning with observed hair fragility and diffuse shedding.

Modern physiology offers complementary explanations. Calcium is vital for cellular adhesion and signaling in keratinocytes; suboptimal levels can impair follicular support, anchorage, and shaft integrity. Phosphorus, tightly regulated, often remains normal in the absence of systemic disease—consistent with our findings. Additionally, scalp ecology— microbiome balance, sebum, hygiene—interacts with oxidative stress from heat styling and cosmetic exposures, further weakening hair shafts.

Age, occupation, and environmental stressors

The concentration of cases in late twenties to mid-thirties coincides with high stress, irregular meals, and processed food consumption. Occupational categories exposed to heat, dust, and pollutants (workers, drivers, farmers) may experience compounded scalp stress, accelerating hair loss even without overt dermatologic disease. These observations underscore the need for preventive occupational counseling and scalp care guidance.

Psychosocial hetus and endocrine interface

While Shoka and Shrama were less frequent, Krodha appeared in the frequent tier. Chronic stress and anger can disrupt sleep, appetite, and endocrine rhythms (e.g., cortisol), indirectly affecting hair cycling. Ayurveda's inclusion of manasika hetus (mental factors) finds resonance in stress-related telogen effluvium and diffuse shedding.

Asthi Dhatu and biochemical correlation

The classical association of Kesha with Asthi Dhatu provides a meaningful interpretive frame. Calcium insufficiency in 55% suggests a dhatu-level vulnerability. Although vitamin D3 and B12 were not measured, clinical practice often reveals co-occurrence of low vitamin D with low-normal calcium, reflecting incomplete dietary correction or limited sun exposure. Future studies should quantify vitamin D3, ferritin, B12, zinc, and thyroid profile to build a comprehensive integrative panel.

Preventive strategies: Nidana parivarjana and nutrition

Nidana parivarjana remains foundational: strict avoidance of Viruddha Ahara and moderation of Lavana/Kshara intake. Emphasize balanced meals, whole foods, adequate protein, and mineral/vitamin sufficiency. Scalp hygiene—gentle cleansing, minimal harsh chemicals, and controlled heat exposure—supports shaft integrity. Stress management— sleep regularity, breathing practices, and routines—addresses manasika hetus.

Limitations

- **Sample size:** Modest cohort limits generalizability.
- **Biochemical scope:** Only calcium and phosphorus measured; broader micronutrient and endocrine panels omitted.
- **Design:** Cross-sectional; cannot infer causality.
- **Self-report bias:** Hetu questionnaire relies on participant recall and honesty.

Future directions

- **Expanded panels:** Vitamin D3, B12, ferritin, zinc, thyroid profile; inflammatory markers where relevant.
- **Design upgrades:** Case–control or longitudinal cohorts to assess risk and recovery trajectories.
- **Interventions:** Randomized trials of Nidana parivarjana plus targeted nutrition vs. standard advice.
- **Scalp ecology:** Assess microbiome, sebum, and product exposure impacts.

CONCLUSION

This study integrates classical Ayurvedic etiologies with modern biochemical data in Khalitya. Dietary hetus—Viruddha Ahara, excess Lavana and Kshara—were predominant, and serum calcium insufficiency was common, while phosphorus remained stable. The findings reinforce the Asthi Dhatu–Kesha linkage and validate prevention-first strategies rooted in nidana parivarjana, nutrition correction, scalp hygiene, and stress management.

Clinically, practitioners should screen for dietary incompatibilities, counsel on salt/alkali moderation, and consider basic biochemical panels, adding vitamin D3/ferritin/B12 when feasible. Integrative management that respects both classical constructs and modern diagnostics can improve outcomes and patient engagement.

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