

VARIATION IN DHATUSARA ACROSS CLASSICAL VAYA (AGE) GROUPS: A CROSS-SECTIONAL ANALYTICAL STUDY USING A STANDARDIZED DIGITAL ASSESSMENT TOOL

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ABSTRACT:

Background: According to Ayurveda, *Bala* (strength), health, resistance to disease, and longevity are all significantly influenced by *Dhatu*sara, which symbolizes the qualitative quality of body tissues. *Baalya*, *Madhyama*, and *Vridhdha Avastha* are the three stages of *Vaya* (age) where increasing age-related changes in tissue quality are described in traditional Ayurvedic literature. However, quantitative evidence supporting these concepts remains limited.

Objective: To assess age-related variations in *Dhatu*sara across the three classical *Vaya* groups using the AyuSoft digital assessment module and to examine the relationship between advancing age and individual *Dhatu*sara parameters.

Materials and Methods A cross-sectional observational study was conducted among 150 apparently healthy individuals selected from Ch. Brahm Prakash Ayurveda Charak Sansthan, New Delhi, and nearby communities. According to the traditional Ayurvedic age classification, participants were divided evenly into three groups: Group A (*Baalya Avastha*, 18–30 years), Group B (*Madhyama Avastha*, 30–60 years), and Group C (*Vridhdha Avastha*, >60 years). Each group consisted of 50 people. The Center for Development of Advanced Computing's (C-DAC) standardized AyuSoft module was used to evaluate *Dhatu*sara.

Results: The mean *Sapta-Dhatu Sara* score decreased significantly as people aged, from $35.79 \pm 5.24\%$ in Group A to $33.26 \pm 5.83\%$ in Group B and $29.88 \pm 8.95\%$ in Group C ($p = 0.0021$). *Rakta Sara* ($p < 0.001$), *Mamsa Sara* ($p = 0.0018$), *Meda Sara* ($p = 0.0027$), *Shukra Sara* ($p = 0.0013$), *Majja Sara* ($p = 0.0493$), *Sattva Sara* ($p = 0.0273$), and *Sarva Sara* ($p < 0.001$) all showed significant age-related decreases. The highest negative correlation with age was seen in *Rakta Sara* (Spearman's $\rho = -0.404$, $p < 0.001$). *Rasa Sara* and *Asthi Sara* did not differ significantly.

Conclusion: The study offers quantitative proof for the traditional Ayurvedic theory of *Dhatu*sara's age-related decline. *Rakta Sara* emerged as the most sensitive indicator of age-related alterations, and advancing *Vaya* was associated with a steady decline in overall tissue quality. The results validate the usefulness of digital *Dhatu*sara assessment in preventive healthcare and Ayurvedic clinical evaluation.

KEYWORDS: *Dhatu*sara; *Sara Pareeksha*; *Vaya*; Ageing; AyuSoft; *Rachana Sharir*

1. INTRODUCTION

One of the most significant demographic shifts of the twenty-first century is the aging of the population, which has led to a rise in the burden of chronic illnesses, functional decline, multimorbidity, and decreased physiological resilience.[1] Accurate markers of tissue quality and functional integrity are crucial for promoting preventative and individualized healthcare as well as for early detection of deteriorating physiological reserve[2][3]. With the traditional concept "*Swasthasya Swasthya Rakshanam, Aturasya Vikara Prashamanam*,"[4] *Ayurveda* offers a comprehensive framework for preserving health and preventing illness. In addition to the healthy functioning of the body, intellect, and senses, health is defined as a state of balance among *Dosha*, *Dhatu*, *Mala*, and *Agni*. [5] *Sara Pareeksha* stands out among the *Dashavidha Pareeksha* because it evaluates the quality of tissues rather than their quantity.[6] Traditionally linked to *Bala*, *Vyadhikshamatva*, vigor, mental stability, reproductive potential, and longevity, *Dhatu*sara symbolizes the exceptional quality and functional integrity of the *Dhatu*s.

Sara (excellence or purity of *Dhatu*s and *Manas*), which results in strength and stability. It evaluates their structure and function both qualitatively and quantitatively, which is examined both physically and psychologically.[7] There are

eight different types of *Sara*: *Tvak*, *Rakta*, *Mamsa*, *Meda*, *Asthi*, *Majja*, *Shukra*, and *Sattva*, as mentioned in Ayurveda.[8][9] Starting with *Tvak*, each subsequent *Sara* is stronger than the one before it, with *Satva Sara* being the most outstanding.[10] The seven main *Dhatu Saras* and their composite evaluation are the main subjects of this study.

According to Ayurveda, *Vaya* is a dynamic process that includes degeneration, maintenance, and growth.[11] According to Acharya Charak, there are three general stages of age: *Baalya Avastha*, *Madhyama Avastha*, and *Jeerna Avastha*. Different changes in tissue development, strength, and *Doshic* predominance are linked to each stage. *Vridhdha Avastha* is characterized by a gradual deterioration in tissue quality, strength, sensory, and cognitive functions with *Vata* predominance; *Madhyama Avastha* represents maximum physiological strength and functional efficiency, and *Baalya Avastha* represents growth and maturation with *Kapha* predominance. These changes show that tissue quality is dynamic and can change depending on the stage of life.[12]

The advancement of digital health instruments has made it possible for Ayurvedic evaluations to become more standardized.[13] C-DAC's AyuSoft decision-support system reduces observer variability and improves consistency by offering a structured platform for quantitative *Dhatu*sara assessment using predetermined clinical parameters.[14] Thus, utilizing the AyuSoft digital evaluation module, the current study was conducted to quantitatively evaluate *Dhatu*sara among healthy members of *Baalya*, *Madhyama*, and *Vridhdha Avastha*. The study intends to support the scientific interpretation of *Sara Pareeksha* and offer objective information regarding age-related changes in tissue quality.

1.1 Knowledge Gap

Despite the fact that *Sara Pareeksha* plays a significant role in *Dashavidha Pareeksha*, there is still no quantitative data regarding age-related variation in individual *Dhatu*sara. The majority of current research is conceptual, disease-specific, or limited to a single age range. It is insufficient to use a standardized digital technique for comparative assessment among the three classical *Vaya* groups and to statistically validate age-related changes in *Dhatu*sara.

1.2 Rationale

The present study was undertaken to quantitatively assess *Dhatu*sara across the three classical *Vaya* groups using the standardised AyuSoft digital module. The study intends to assess age-related changes in tissue quality and offer empirical support for the traditional concept of gradual *Dhatu* decline using statistical analysis and Ayurvedic principles. The results could improve *Sara Pareeksha*'s clinical use and its function in Ayurvedic geriatric and preventive healthcare.

1.3 Aim

- To estimate the variation in *Dhatu*sara among different classical age groups.
- Objectives
- To estimate the *Dhatu*sara of the individual in three different age groups (preferably *Bala Vaya*, *Madhya Vaya* and *Vridha Vaya*) over the entire duration of research.
- To compare *Dhatu*sara scores among the three classical *Vaya* groups.

1.4 Hypothesis

There is a significant effect of *Vaya* (age) on the *Dhatu*sara of the individuals.

2. MATERIALS AND METHODS

2.1 Study Design and Setting

At the Department of Rachana Sharir, Ch. Brahm Prakash Ayurveda Charak Sansthan (CBPACS), Khera Dabar, New Delhi, India, a cross-sectional observational study was carried out. Over the course of a year, participants were gathered from the hospital's campus, the outpatient department, and surrounding communities. Before the study began, the Institutional Research Committee (IRC) and Institutional Ethics Committee (IEC) of CBPACS approved the protocol. Before enrollment, each subject provided written informed consent.

2.2 Ethical Approval

The study protocol was reviewed and approved by the Institutional Ethics Committee of CBPACS with Approval No. CBP-IEC/2024/RS/MD/02. (CTRI No. CTRI/2025/03/081907).

2.3 Study Population

The study comprised 150 people who seemed to be in a healthy state. According to the age classification outlined in the Charaka Samhita, participants were split equally into three classical *Vaya* groups, which were chosen to symbolize the developing, mature, and degenerative stages of life.

- Group A (*Baalya Avastha*): 50 individuals, 18 to 30 years
- Group B (*Madhyama Avastha*) : 30–60 years
- Group C (*Vridhdha Avastha*): over 60 years

All three age groups' comparisons were balanced according to the equal distribution of participants.

2.4 Sample Size and Sampling Technique

A total of 150 individuals, equally represented from each traditional *Vaya* group, were recommended by the

Institutional Research Committee. Purposive sampling was used to recruit participants until the desired sample size was reached.

2.5 Inclusion Criteria

Apparently healthy individuals of the age groups irrespective of gender: *Baalya Avastha* (18-30 years), *Madhyam Avastha* (30-60 years), *Jeerna Avastha* (>60 years)

2.6 Exclusion Criteria

Person suffering from any acute or chronic illness, Pregnant woman, any congenital or acquired anomaly, Person having any kind of co-morbidity like T2DM, HTN, THYROID DYSFUNCTION, CVD, etc.

2.7 Dhatusara Assessment

The standardized AyuSoft Software, created by the Center for Development of Advanced Computing (C-DAC), Government of India, was used to evaluate Dhatusara. The software uses predetermined physical and functional traits from traditional Ayurvedic literature to assess the qualitative quality of the seven main *Dhatus*.

Sara parameters of all the subjects are evaluated: *Rasa Sara*, *Rakta Sara*, *Mamsa Sara*, *Meda Sara*, *Asthi Sara*, *Majja Sara*, *Shukra Sara*, *Sattva Sara*, and *Sarva Sara*.

The questionnaire incorporates psychological, physiological, and anatomical traits into a standardized digital evaluation platform that is standardized. The software automatically generated quantitative scores for each *Dhatusara* and their categorical classification (*Pravara*, *Madhyama*, and *Avara*) based on responses entered. This systematic methodology reduced observer fluctuation and ensured consistent evaluation for every participant.

The software produced unique percentage scores for each Sara participant. The arithmetic mean of the seven primary *Dhatu Sara* percentages was then used to compute a composite Mean *Sapta-Dhatu Sara* score. The weighted scoring mechanism built into the AyuSoft module was used to determine individual *Sara* percentages.

2.8 Data Collection Procedure

The AyuSoft program was used for clinical evaluation once eligible individuals had their demographics recorded. Age, sex, occupation, marital status, educational background, and socioeconomic level were among the demographic factors. The AYUSOFT questionnaire was then used for each participant's *Dhatusara* assessment. All answers were input into the digital platform when the assessment was finished. Following evaluation, the software-generated *Dhatusara* scores were instantly recorded, placed into a master database, and validated before statistical analysis.

2.9 Outcome Measures Primary Measures

- Mean *Sapta-Dhatu Sara* for the three traditional *Vaya* groups is compared.

Secondary Measures

- Individual *Dhatu Sara* scores for each age group are compared.
- Individual *Dhatusara* and chronological age are correlated.
- The distribution of *Sara's* grades among the various *Vaya* groups.
- When appropriate, a gender comparison of *Dhatusara*.

2.10 Statistical Analysis

Microsoft Excel was used to enter the data, and the relevant statistical software was used for analysis. The Shapiro-Wilk test was used to determine whether continuous variables were normal. Non-parametric statistical techniques were used because most variables were non-normally distributed. The statistical tests listed below were run: The data was summarized using descriptive statistics; the Kruskal-Wallis test was used to compare the three age groups; the Mann-Whitney U test with Bonferroni correction was used for pairwise comparisons; the association between *Vaya* and *Dhatusara* was assessed using Spearman's rank correlation; the chi-square test was used for categorical variables; age-related decreases were estimated using simple linear regression; and the magnitude of observed differences was determined using effect size estimation (ϵ^2). At $p < 0.05$, statistical significance was taken into consideration.

Table 1. Summary of Study Methodology

Parameter	Description
Study design	Cross-sectional observational study
Study setting	Department of Rachana Sharir, CBPACS, New Delhi
Study duration	12 months
Sample size	150 participants
Age groups	<i>Baalya</i> (18–30 years), <i>Madhyama</i> (30–60 years), <i>Vridhdha</i> (>60 years)
Assessment tool	AyuSoft (C-DAC)
Primary outcome	Mean <i>Sapta-Dhatu Sara</i>
Statistical tests	Shapiro–Wilk, Kruskal–Wallis, Mann–Whitney U, Spearman correlation, Chi-square, Linear regression, Effect size (ϵ^2)

Level of significance	p < 0.05
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3. Observations & Results

3.1 Participant's Demographic Characteristics

A total of 150 apparently healthy individuals were enrolled in the study and equally distributed among the three classical *Vaya* groups, with 50 participants in each group. The mean age of Group A (*Baalya Avastha*) was 23.80 ± 3.02 years, Group B (*Madhyama Avastha*) was 43.44 ± 9.70 years, and Group C (*Vridhdha Avastha*) was 67.66 ± 7.03 years. Females constituted 58.0% (n = 87) of the study population, while males accounted for 42.0% (n = 63).

3.2 Comparison of Mean Sapta-Dhatu Sara among the three Vaya Groups

As age increased, the Mean *Sapta-Dhatu Sara* score showed a steady fall. The highest mean score was $35.79 \pm 5.24\%$ for Group A, $33.26 \pm 5.83\%$ for Group B, and $29.88 \pm 8.95\%$ for Group C. There was a statistically significant difference between the three groups (Kruskal-Wallis H = 12.347, p = 0.0021).

Table 2. Baseline Characteristics of the Study Population

Variable	Group A (18–30 y)	Group B (30–60 y)	Group C (>60 y)	Total
Sample size	50	50	50	150
Mean age (years)	23.80 ± 3.02	43.44 ± 9.70	67.66 ± 7.03	—
Female, n (%)	36 (72.0)	26(52.0)	25(50.0)	87 (58.0)
Male, n (%)	14 (28.0)	24(48.0)	25(50.0)	63 (42.0)

Table 3. Comparison of Mean Sapta-Dhatu Sara Across Classical Vaya Groups

Group	n	Mean $\pm$ SD	Median (IQR)	Min – Max
Group A	50	35.79 ± 5.24	36.40 (31.80–39.29)	25.72 – 47.32
Group B	50	33.26 ± 5.83	33.59 (29.25–37.79)	18.50 – 44.95
Group C	50	29.88 ± 8.95	31.23 (25.67–36.53)	6.96 – 43.44
Overall	150	32.98 ± 7.24	34.44 (28.98–38.26)	6.96 – 47.32

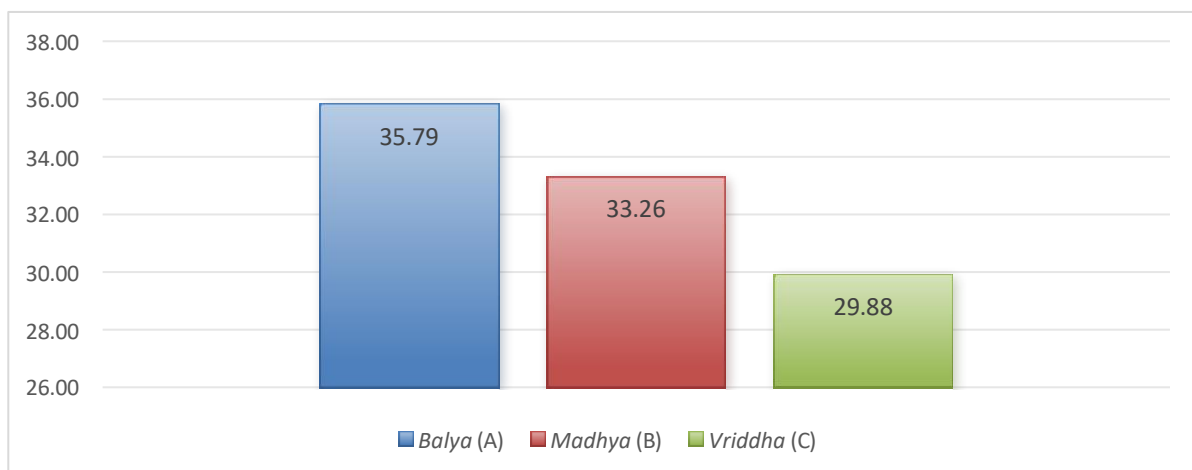


Figure 1. Mean Sapta-Dhatu Sara across the Three Classical Vaya Groups

3.3 Comparison of Individual Dhatusara Scores

Rakta Sara, *Mamsa Sara*, *Meda Sara*, *Majja Sara*, *Shukra Sara*, *Sattva Sara*, and *Sarva Sara* showed statistically significant variances among the individual *Dhatusara* parameters. *Rasa Sara* and *Asthi Sara*, on the other hand, did not show statistically significant differences between the three age groups.

Table 4. Kruskal–Wallis Comparison of Individual Dhatusara Parameters

Variable	KW H (df=2)	p-value	Result
<i>Rasa Sara</i>	4.597	0.1004 (ns)	Not significant
<i>Rakta Sara</i>	19.134	< 0.001 ***	Significant
<i>Mamsa Sara</i>	12.644	0.0018 **	Significant
<i>Meda Sara</i>	11.795	0.0027 **	Significant
<i>Asthi Sara</i>	2.796	0.2471 (ns)	Not significant
<i>Majja Sara</i>	6.019	0.0493 *	Significant

<i>Shukra Sara</i>	13.342	0.0013 **	Significant
<i>Sattva Sara</i>	7.200	0.0273 *	Significant
<i>Sarva Sara</i>	17.641	< 0.001 ***	Significant
<i>Mean Sapta Dhatu Sara</i>	12.347	0.0021 **	Significant

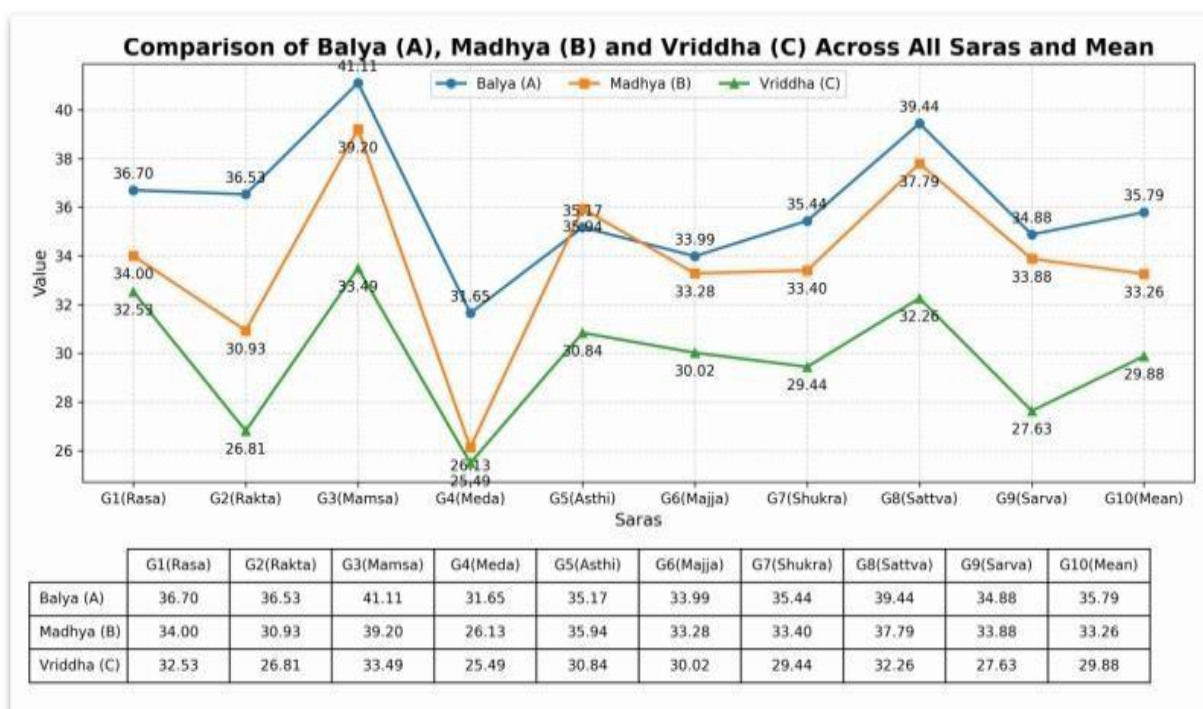


Figure 2. Comparison of Individual Dhatusara Scores Across the Three Vaya Groups

3.3.1 Pairwise Post-hoc Comparison

The *Baalya* and *Vridhdha* groups showed the biggest differences, according to pairwise analysis using the Mann–Whitney U test with Bonferroni correction. Comparisons between adjacent age groups (A vs B and B vs C) were less consistently significant, suggesting that tissue degradation became more noticeable with longer age intervals.

Table 5. Pairwise Comparisons (Mann–Whitney U with Bonferroni Correction)

Variable	A vs B (p)	A vs C (p)	B vs C (p)	Remark
Rasa Sara	0.4269 (ns)	0.1182 (ns)	1.0000 (ns)	No pairwise difference
Rakta Sara	0.0375 *	< 0.001 ***	0.2352 (ns)	A differs from B and C
Mamsa Sara	0.6916 (ns)	0.0021 **	0.0444 *	C differs from A and B.
Meda Sara	0.0158 *	0.0059 **	1.0000 (ns)	A differs from B and C.
Asthi Sara	1.0000 (ns)	0.6179 (ns)	0.3479 (ns)	No pairwise difference
Majja Sara	1.0000 (ns)	0.0695 (ns)	0.2331 (ns)	No pairwise difference
Shukra Sara	0.5502 (ns)	0.0011 **	0.0564 (ns)	A vs C only
Sattva Sara	1.0000 (ns)	0.0348 *	0.1245 (ns)	A vs C only
Sarva Sara	1.0000 (ns)	< 0.001 ***	0.0032 **	C differs from A and B
Mean Sapta Dhatu Sara	0.1270 (ns)	0.0024 **	0.2380 (ns)	A vs C only

3.3.2 Correlation Between Age and Dhatusara

Nearly all *Dhatusara* characteristics showed negative associations with chronological age, according to Spearman rank correlation analysis. Sarva Sara ($\rho = -0.380$), Mean *Sapta-Dhatu Sara* ($\rho = -0.332$), and *Rakta Sara* ($\rho = -0.404$, $p < 0.001$) had the highest negative connection with age. *Asthi Sara* did not achieve statistical significance and showed the weakest association.

3.3.3 Effect Size Analysis

Rakta Sara had the biggest age-related effect ($\epsilon^2 = 0.1166$), followed by Mean *Sapta-Dhatu Sara* ($\epsilon^2 = 0.0704$) and *Sarva Sara* ($\epsilon^2 = 0.1064$), which showed intermediate effect sizes. *Asthi Sara*, on the other hand, showed a small effect size, suggesting little difference between age groups.

Table 6. Spearman Rank Correlation and Effect Size (ϵ^2) of Age on Individual Dhatusara

Variable	Spearman ρ	p-value	Direction	ϵ^2 (Epsilon squared)	Magnitude
Rasa Sara	-0.225	0.0056 **	Negative	0.0177	Small
Rakta Sara	-0.404	< 0.001 ***	Negative	0.1166	Medium
Mamsa Sara	-0.293	< 0.001 ***	Negative	0.0724	Medium
Meda Sara	-0.322	< 0.001 ***	Negative	0.0666	Medium
Asthi Sara	-0.109	0.1823 (ns)	Negative	0.0054	Negligible
Majja Sara	-0.232	0.0043 **	Negative	0.0273	Small
Shukra Sara	-0.319	< 0.001 ***	Negative	0.0772	Medium
Sattva Sara	-0.254	0.0017 **	Negative	0.0354	Small
Sarva Sara	-0.380	< 0.001 ***	Negative	0.1064	Medium
Mean Sapta Dhatu Sara	-0.332	< 0.001 ***	Negative	0.0704	Medium

3.3.4 Distribution of Sara Grades

The percentage of *Avara Sara* increased with age, according to an analysis of categorical Sara grades. In the *Vridhdha* group, the prevalence of *Avara* grade increased from 28% in the *Baalya* group to 58% ($\chi^2 = 9.253$, $p = 0.0098$). Interestingly, not a single person in any age group received the *Uttama (Pravara)* rating.

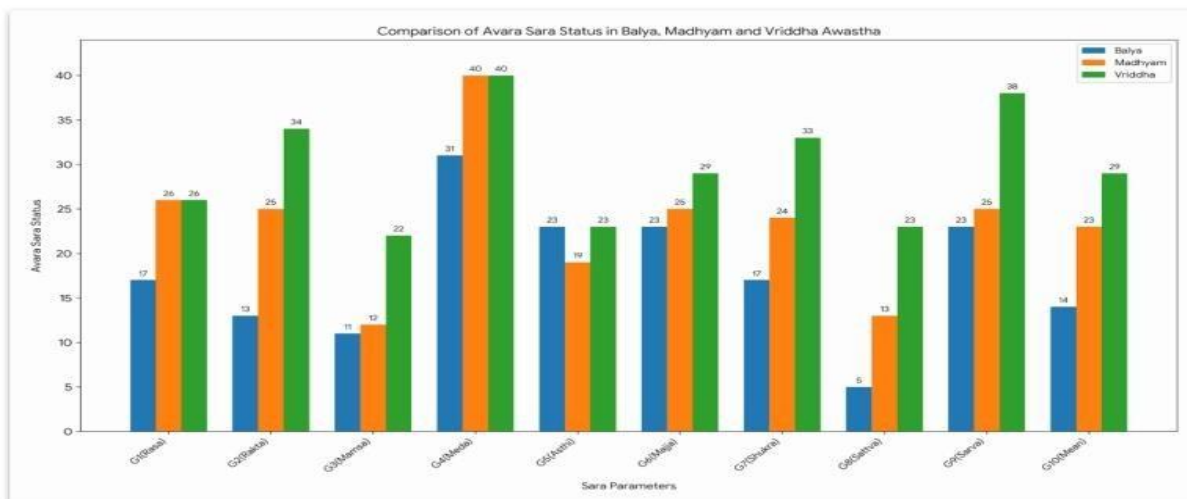


Figure 3. Distribution of Sara Grades Across the Three Vaya Groups

4. DISCUSSION

4.1 Age-related Decline in Mean *Sapta-Dhatu Sara*

All three traditional *Vaya* groups showed a statistically significant decline in Mean *Sapta-Dhatu Sara*, with the composite score gradually declining from *Baalya* to *Vriddha Avastha*. This suggests that total tissue excellence gradually decreases with aging. Ayurveda states that *Madhyama Avastha* is the time of maximal physiological strength, maturity, and functional efficiency, whereas *Baalya Avastha* is defined by the active growth, development, and nutrition of the *Dhatus*. Tissue integrity and physiological capacity deteriorate in *Vriddha Avastha* due to progressive *Dhatu Kshaya*, declining *Bala*, and a preponderance of *Vata Dosha*. These traditional explanations of age-related changes in tissue quality are quantitatively supported by the observed decline in Mean *Sapta-Dhatu Sara*. Additionally, the gradual decline raises the possibility that *Dhatusara* is not just a reflection of chronological age but also of biological aging and functional tissue state. As a result, it might be an important indicator in preventative and geriatric Ayurvedic medicine as well as an integrative measure of tissue quality.

4.2 Interpretation of Individual Dhatusara

Although *Rasa Sara* showed a numerical decline with advancing age, the difference did not reach statistical significance. Maintenance of *Rasa Sara* despite advancing age may indicate preservation of basic nutritional mechanisms or may reflect the limited sensitivity of currently available assessment criteria. Future research with objective biochemical and nutritional markers could offer more insight.

4.2.2 Rakta Sara

Rakta Sara exhibited the greatest effect size and the highest negative correlation with age among the individual Dhatusara parameters, suggesting a higher susceptibility to age-related alterations. *Rakta Dhatu* appears to deteriorate with age, as seen by the three *Vaya* groups' steady decline. *Rakta Dhatu* is linked to vitality, complexion, nourishment, and vital life activities in *Ayurveda*. [15] Its deteriorating quality could be a result of decreased physiological reserve, metabolic efficiency, and tissue nutrition. Thus, in the context of *Sara Pareeksha*, *Rakta Sara* might be a potentially helpful sign of biological aging.

4.2.3 Mamsa Sara

Mamsa Sara demonstrated a significant decline with advancing age. This finding is consistent with the gradual reduction in muscle bulk and strength commonly observed during ageing. *Mamsa Dhatu* offers stability, strength, and endurance. [16] Therefore, progressive reduction in *Mamsa Sara* corresponds with ancient descriptions of *Dhatu Bala* during *Vriddha Avastha* and represents deteriorating tissue integrity and diminished physical potential.

4.2.4 Meda Sara

Among elderly people, the current study showed a considerable decrease in *Meda Sara*. According to Ayurvedic literature, adequately nourished *Meda Dhatu* is necessary for bodily tissue preservation, lubrication, and energy storage. [17] Age-related changes in tissue metabolism and nutritional status may be the cause of the observed reduction. While the distribution of body fat varies with age, *Meda Dhatu's* quality seems to gradually deteriorate.

4.2.5 Asthi Sara

Asthi Sara was unable to show statistically significant differences across the three age groups. It is often regarded as relatively stable in classical Ayurvedic literature. Furthermore, rather than using objective

measurements of bone health, the AyuSoft assessment module mainly assesses external morphological traits. Therefore, employing observational evaluation alone may not be sufficient to capture subtle age-related changes in *Asthi Dhatu*. Future study could be enhanced by combining DEXA scanning or bone mineral density measurement with *Asthi Sara* appraisal.

4.2.6 Majja Sara

Across all age categories, *Majja Sara* displayed a slight but statistically significant reduction. According to Ayurveda, *Majja Dhatu* nourishes bone marrow, nerve tissue, and cognitive stability.[18] Therefore, a gradual decline in *Majja Sara* may be a sign of aging-related declines in tissue nutrition and neurophysiological processes.

4.2.7 Shukra Sara

In the current study, *Shukra Sara* showed a notable age-related drop. *Shukra Dhatu* is described in classical sources as the ultimate determinant of vitality, reproductive capacity, and regenerative potential, as well as the essence of all previous *Dhatus*.[19] Therefore, a decrease in *Shukra Sara* with age is consistent with both decreased reproductive function and physiological aging. These findings support the traditional theory that higher-order *Dhatus* degeneration becomes more noticeable as people age.

4.3 Correlation Between Age and Dhatusara

Individual *Dhatusara* characteristics and chronological age showed mostly negative correlations, according to Spearman correlation analysis. The largest negative relationships were found in *Rakta Sara*, *Sarva Sara*, and Mean *Sapta-Dhatu Sara*, suggesting that tissue excellence gradually declines with age.

The reliability of the observed age-related patterns is supported, and the study's internal validity is strengthened by the consistency between correlation analysis, regression analysis, and effect size estimation.

4.4 Gender-wise Findings

Despite the study's inclusion of both males and females, age had a significantly greater impact on *Dhatusara* than gender. The Ayurvedic view that *Vaya* is one of the main factors influencing tissue quality and physiological strength is in accordance with this observation.

4.5 Validation of Classical Ayurvedic Concepts

The overall findings of this study provide robust, multi-layered empirical validation for several foundational *Ayurvedic* concepts.

The classical tripartite division of *Vaya* into *Baalya Avastha*, *Madhyam Avastha*, and *Jeerna Avastha* as described in Charaka Samhita[20] was found to clearly and significantly differ in their *Dhatusaara* profiles in exactly the directions predicted by classical texts — with the best *Sara* scores in *Madhyam Avastha* or *Baalya Avastha*, and the most deteriorated scores in *Vridhdha Avastha*.

The principle of *Bhrasyamana Dhatuguna* [21] — the gradual deterioration of *Dhatu* quality in *Vridhdha Avastha* — was confirmed with statistical significance for the majority of *Saras*, including *Rakta Sara*, *Mamsa Sara*, *Shukra Sara*, *Meda Sara*, *Sattva Sara*, and *Sarva Sara*. Two *Saras* — *Rasa Sara* and *Asthi Sara* — did not reach statistical significance, but both showed numerical trends consistent with the expected direction of change, suggesting that these may require more sensitive assessment tools or larger sample sizes.

The practical feasibility and reliability of using the AyuSoft digital module for *Dhatusaara* assessment in a clinical research setting was demonstrated. The tool allowed for standardised, consistent, and reproducible administration across all subjects, overcoming the inherent inter-observer variability associated with purely subjective traditional clinical assessment. This represents an important methodological contribution to the field of *Rachana Sharir* and Ayurvedic clinical sciences.

A notable observation across all age groups was that no subject attained *Uttam (Pravara)* grade for any *Sara*. This is a significant finding in itself. Classical texts describe *Pravara Sara Purusha* as an exceptionally rare ideal. The absence of *Uttam* grade subjects in the present study population — which comprised apparently healthy, community-dwelling individuals — suggests that under contemporary lifestyle conditions characterised by irregular diet, sedentary habits, sleep disturbances, and psychological stress, optimal *Dhatusaara* may be very difficult to achieve. This has important implications for preventive Ayurvedic medicine and the relevance of *Rasayana* and *Swasthavritta* (health-promotive) interventions in the modern context.

4.6 Overall Findings

The present study quantitatively assessed *Dhatusara* across the three classical *Vaya* groups using the AyuSoft digital assessment module. A progressive and statistically significant decline in Mean *Sapta-Dhatu Sara* was observed from *Baalya* to *Vridhdha Avastha*; *Rakta Sara* showed the strongest association with age, whereas *Rasa Sara* and *Asthi Sara* did not demonstrate significant differences. The increasing predominance of *Avara Sara* in older participants further supports the classical concept of progressive *Dhatu Kshaya* during ageing.

5. CONCLUSION

The current study adopted the AyuSoft digital evaluation tool to quantitatively evaluate *Dhatusara* in 150 people who appeared to be in a healthy condition across the three *Vaya* groups (*Baalya*, *Madhyama*, and *Vridhdha Avastha*). The results showed that Mean *Sapta-Dhatu Sara* significantly and steadily decreased with

age, offering objective proof in favor of the traditional Ayurvedic theory that tissue excellence declines with aging.

Rakta Sara, *Sarva Sara*, and *Mean Sapta-Dhatu Sara* showed the highest correlation with age among the individual *Dhatu*sara parameters, suggesting that these characteristics could function as sensitive markers of biological aging within the Ayurvedic framework. *Mamsa Sara*, *Meda Sara*, *Majja Sara*, *Shukra Sara*, and *Sattva Sara* similarly revealed significant age-related reductions; however, *Rasa Sara* and *Asthi Sara* did not show statistically significant differences among the three *Vaya* groups, despite both exhibiting declining trends. The absence of *Uttama Sara* in every study participant and the predominance of *Avara Sara* in the older population indicate how tissue excellence gradually deteriorates with age under modern lifestyle conditions. The Ayurvedic concept of sequential *Dhatu Poshana*, which holds that the integrity of one *Dhatu* affects the nourishment and quality of successive tissues, is quantitatively supported by the observed positive correlations among many *Dhatu*sara metrics. Additionally, age was found to be a significantly stronger predictor of *Dhatu*sara than gender, supporting the traditional Ayurvedic belief that *Vaya* is a key factor in defining *Bala* and *Dhatu* quality.

Additionally, the study shows that the AyuSoft digital assessment module provides a practical and standardized method for objective *Dhatu*sara evaluation. *Sara Pareeksha*'s reproducibility could be enhanced by digital assessment, which could also make it easier to include it in future research, geriatric evaluation, preventative health assessment, and standard Ayurvedic clinical practice.

Overall, the present study provides quantitative scientific evidence supporting the classical Ayurvedic descriptions of age-related changes in *Dhatu*sara. By integrating traditional Ayurvedic principles with a standardised digital assessment methodology and contemporary statistical analysis, the study contributes to strengthening the evidence base of *Rachana Sharir* and highlights the potential clinical relevance of *Dhatu*sara assessment in personalised and preventive Ayurvedic healthcare.

6. Strengths of the Study

1. *Dhatu*sara was quantitatively evaluated utilizing the standardized AyuSoft (C-DAC) digital module across three classical *Vaya* groups.
2. Thorough evaluation of *Sarva Sara*, *Mean Sapta-Dhatu Sara*, and individual *Dhatu Sara*.
3. The results were reinforced by the application of suitable statistical techniques and effect-size analysis.
4. Combined traditional Ayurvedic ideas with contemporary theories of aging, offering early proof of *Dhatu*sara's progressive changes with age.

7. Limitations of the Study

1. Larger multicentric research is required because limited sample size and geographic coverage limit the generalizability of findings.
2. The cross-sectional design makes it impossible to directly evaluate how *Dhatu*sara changes over time as people age. *Asthi Sara*'s evaluation was predicated on outward characteristics; objective metrics like bone mineral density (BMD) might offer a more accurate association.

8. Future Scope of the Study

1. To determine reference values and evaluate age-related changes in *Dhatu*sara, conduct extensive multicentric and longitudinal research across a variety of groups.
2. Combine objective biophysical indicators, such as BMD, hormonal, haematological/biochemical, cognitive, and psychological markers, with *Dhatu*sara evaluation.
3. Create sophisticated digital evaluation tools with quantifiable parameters for increased precision and repeatability. Examine how *Dhatu*sara interacts with *Prakriti*, *Agni*, *Bala*, and *Ojas* to comprehend each person's health.
4. Examine the use of *Dhatu*sara in individualized, geriatric, and preventive Ayurvedic medicine.

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