



Research Article

Comparative study of Asthi Sandhi Praman in Asthi Sara and Rakta Sara purush

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Abstract

Introduction: In *Ayurveda*, *Dhatus* are formed from the nutrients of digested food and are nourished sequentially, as described in *Kedari Kulya Nyaya*. *Asthi Dhatu* is nourished by *Meda Dhatu* and in turn supports *Majja Dhatu*. This sequential interdependence may introduce bias in assessment; therefore, *Rakta Dhatu*, being non-adjacent to *Asthi Dhatu*, was selected for comparative evaluation. *Asthi Sara* individuals are characterized by well-developed, sturdy skeletal structures, whereas *Rakta Sara* individuals exhibit soft, radiant, and moderately built features. **Objectives:** To assess *Asthi Sandhi Praman* in *Asthi Sara Purush* and *Rakta Sara Purush*, and to compare the joint dimensions between these two groups. **Methodology:** Following approval from the Institutional Ethics Committee and obtaining informed consent, participants were enrolled and categorized into two groups: *Asthi Sara* (Group A) and *Rakta Sara* (Group B) with the help of *Sarata Parikshana*. Anthropometric parameters including height, weight, joint circumferences (knee, elbow, ankle), joint widths (measured using vernier callipers), head circumference, heel width, axilla width, and *Anguli Praman* were recorded. Statistical analysis was performed using the two-sample t-test. **Results:** The mean values of height, weight, and all measured joint parameters were significantly higher in *Asthi Sara Purush* compared to *Rakta Sara Purush* ($p < 0.05$), indicating broader and more robust skeletal and joint structures. **Conclusion:** *Asthi Sara Purush* demonstrate significantly greater skeletal dimensions and joint breadth, reflecting optimal nourishment and functional integrity of *Asthi Dhatu*. These findings substantiate that enhanced *Asthi Sarata* is associated with superior structural stability compared to *Rakta Sara Purush*.

Keywords: *Dhatu*, *Dhatu Poshan Nyaya*, Shoulder joint, Knee joint, Elbow joint, Ankle joint

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Introduction

As per the *Ayurveda*, *Dhatus* are formed from the nutrients of digested food. The process of how they are formed is explained through three main theories these are *Dadhiksheera Nyaya*, *Kedari Kulya Nyaya*, *Khale Kapota Nyaya*. From these theories, most agree the *Kedari Kulya Nyaya* is the most reliable overall. As per the *Kedari Kulya Nyaya*, *Dhatus* are nourished in sequence. So it can be considered that the *Asthi Sarata* is the result of good amount of nourishment provided by previous i.e. *Meda Dhatu*. The presence of *Asthi Dhatu Sarata* will also provide the adequate amount of nourishment to the next *Dhatu* i.e. *Majja Dhatu*. (1)

This Inter-dependability in the *Dhatus* may cause error in the observations and results. An error may arise when *Majja Sara*

(adjacent to *Asthi Sara*) is selected for the comparison of *Asthi Sandhi Praman*, as it may introduce bias. In *Majja Sara* individuals, *Asthi Dhatu* is already well nourished, leading to overlapping characteristics with *Asthi Sara*, such as broader and elongated joint structures. (2)

To avoid errors caused by interdependence, we chose only one *Dhatu Sara* for comparison. Since *Rakta Dhatu* does not come before or after *Asthi Dhatu* in sequence, we selected individuals with *Rakta Dhatu Sara* to compare *Asthi Sandhi* measurements with those of individuals having *Asthi Dhatu Sara*.

Asthisara Purush Lakshan

The wrists, ankles, knees, neck region (joint), chin and head region of the *Asthisara* person are too pronounced and sturdy.

The bones, nails and teeth are also larger in size and entire body is broad and sturdy.

The *Asthisara* personalities are over enthusiasts, industrious, stable and strong bodies individuals who can tolerate strain and are known to head long lives.

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Raktasara Purush Lakshan

The person with *Rakta Sara* exhibits qualities of a healthy and well nourished *Rakta Dhatu* with essence traits. The ear lobes, eyes, oral cavity, nose, palms of hands and feet, lips and nails of a *Rakta Sara* person are *Snigdha*, radiant and exhibit a reddish hue.

The *Rakta Sara* personalities are intellectual with sharp grasping powers, tenders, enthusiastic and with average physical strength and a peaceful lifestyle, they are intolerant to heat and strain. (3)

Need of the Study

This study is needed to understand whether the characteristics of *Asthi Sandhi Praman* differ in individuals with different *Dhatu Sara* types. By examining and comparing *Asthi Sandhi Praman* in *Asthi Sara Purush* and *Rakta Sara Purush*, the study aims to generate clearer scientific evidence regarding structural variations in the body based on constitutional differences.

It also helps in identifying whether *Asthi Sara* individuals show distinct skeletal joint measurements compared to *Rakta Sara* individuals, which can improve understanding of body constitution assessment in *Ayurveda*.

Overall, the study is important for strengthening the concept of *Dhatu Sara* and for providing a comparative basis for evaluating *Asthi Sandhi Praman* across different physiological types.

Aim: To compare *Asthi Sandhi Praman* in *Asthi Sara Purush* and *Rakta Sara Purush*.

Objectives:

1. To study *Asthi Sandhi Praman* in *Asthi Sara Purush*.
2. To study *Asthi Sandhi Praman* in *Rakta Sara Purush*.
3. To compare *Sandhi Praman* in *Asthi Sara Purush* with *Rakta Sara Purush*.

It helps clinicians better identify and confirm the structural differences between *Asthi Sara* and *Rakta Sara* persons, improving accuracy in *Dhatu Sara* assessment.

Study Participants: Sample Size was 60

Inclusion Criteria: The study included male and female participants belonging to the age group of 25–35 years. Participants who were identified as *Asthi Sara* and *Rakta Sara Purush* were included in the study.

Exclusion Criteria: Individuals who showed features of *Dhatu Vruddhi* or *Dhatu Vikriti* were excluded from the study to avoid any influence of abnormal tissue conditions on the observations. Participants suffering from chronic diseases were also excluded, as such conditions could have affected normal physiological measurements. In addition, individuals with a recent history of fracture or injury were excluded to ensure that the *Asthi Sandhi Praman* reflected normal anatomical conditions.

Materials & Methodology

Patients: Healthy participants were recruited in the trial according to standard ethical and clinical research protocol, including informed consent and predefined inclusion criteria.

Equipment to be used:

1. Standardized Weighing machine (Calibrated)
2. Measuring tape (Calibrated)
3. Vernier Calipers

4. Standard *Sarata* examination proforma (AYUSOFT C-DAC -Centre for Development of Advance Computing).

Study Type : Observational Study

Study Design: Target Population

Participant either of *Asthi Sara Purush* or *Rakta Sara Purush*

Study Site : This study was conducted in College of Ayurved and Hospital, Bharati Vidyapeeth Deemed to be University, Pune.

1. After getting permission from Institutional Ethics Committee, study was started.
2. Enrollment of Subjects: Participants fulfilling inclusion criteria and those were willing to participate and have given an acceptance in the form of informed consent were enrolled in the study.
3. The above topic and methodology was explained to the participant. Then consent forms were filled by participants.
4. *Sarata parikshana* (examination) was done with the help of standard *Sarata Parikshana* Proforma (CDAC). (4)
5. Two group were formed having participants (male and female) either of *Asthi Sara Purush* or *Rakta Sara Purush*
 - a. Group A: Participant of *Asthisara Purush*.
 - b. Group B: Participant of *Raktasara Purush*.
6. Anthropometric measurements for finding significance ratio between *Asthi Sara Purush* and *Rakta Sara Purush* with respect to *Sandhi Praman* were measured with all SOPs (Standard Operating Procedure) like
 - I. Height and weight were measured in multiple of 0.1 cm in height and 0.1 kg in weight.
 - II. Knee joint circumference was measured at the center of the knee top(mid patella) while individual knee is bent at 45° angle, placing the beginning part of the measuring tape their and wrap the measuring tape around this section until it meets the starting point where the state needs the starting point, mark the circumference and noted it.(5) This step was repeated for both knee joint and average knee joint circumference was recorded.
 - III. Elbow joint circumference is taken around the medial and lateral epicondyle at the widest point. The measurer let the tape fall along the crease of the inner elbows. The measurement is taken at the maximum point of quite respiration.(6) This step was repeated for both elbow joint and average elbow joint circumference was recorded.
 - IV. Ankle circumference: the measuring tape is placed at the narrowest part of the ankle.(7) This step was repeated for both ankle joint and average ankle joint circumference was recorded.
 - V. Head circumference : the measuring tape was wrapped around the largest part of the head. From the forehead above the eyebrow, around the back to rest in the middle of occipital bone and back to the starting point. (8)
 - VI. Vernier Calipers was used for measurement of joints:
 - a. Elbow joint: Midline axes of the humerus and ulna, and the center of both medial and lateral epicondyles are fixed as standardized lines for the study in the elbow measurement. Both jaws of vernier caliper were kept on

those points and measurement was noted.(9) This step was repeated for both elbow joint and average joint widths were recorded.

- b. Knee joint: the inflection point of medial femoral epicondyle and the proximal end of the tibia (lateral condyle of tibia), were taken as the landmarks for measurement of knee joint.(10) Both jaw of vernier callipers were kept on those points and measurements were noted. This step was repeated for both knee joint and average joint width was recorded.
- c. *Anguli Praman*: We took the *Swa-anguli Praman* by measuring the width of middle interphalangeal joint of middle finger of a hand.(11) This step was repeated for both hand and average *Anguli* width was recorded.
- d. Heel width : To assess heel width, the vernier callipers was placed around the heel. The jaws of vernier callipers were

then moved together until they just made contact with the skin on the lateral and medial sides of the heel. Once both rods made contact with the skin, the distance was measured . (12) This step was repeated for both side and average heel width was recorded.

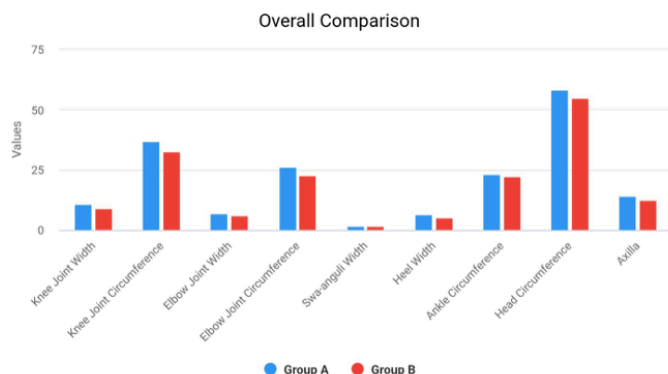
- e. Axilla : Placed one fixed jaw of the vernier callipers on the tip of the acromion process and the other jaw on the most prominent point of the lesser tubercle.(13)(14)(15)(16) This step was repeated for both sides and average axilla width was recorded.
7. The assessment parameters were recorded and analyzed by using two sample t test.
8. *Asthi Sandhi Praman* were compared in between *Asthi Sara Purush* and *Rakta Sara Purush*.

Results and interpretation

Table 1: Showing the results of the treatment

Sr. No.	Parameter	Group	Mean	SD	Mean Difference	T	P Value
1	Height	Group A	180.40	5.78	22.65	16.704	7.85E-24 (<0.0001)
		Group B	157.75	4.66			
2	Weight	Group A	67.35	6.61	6.06	4.386	4.93E-5 (<0.0001)
		Group B	61.29	3.70			
3	Knee Joint Width	Group A	10.57	0.52	1.52	13.8795	4.4E-20 (<0.0001)
		Group B	9.05	0.30			
4	Knee Joint Circumference	Group A	37.05	1.98	4.56	10.370	7.9E-15 (<0.0001)
		Group B	32.49	1.36			
5	Elbow Joint Width	Group A	6.81	0.19	0.88	13.453	1.7E-19 (<0.0001)
		Group B	5.93	0.30			
6	Elbow Joint Circumference	Group A	25.97	1.85	3.43	9.751	7.8E-14 (<0.0001)
		Group B	22.54	0.54			
7	<i>Swa-anguli</i>	Group A	1.76	0.09	0.19	9.617	1.3E-13 (<0.0001)
		Group B	1.57	0.06			
8	Heel Width	Group A	6.60	0.41	1.35	16.264	2.8E-23 (<0.0001)
		Group B	5.25	0.19			
9	Ankle Circumference	Group A	23.04	1.09	0.90	3.456	0.00103
		Group B	22.14	0.92			
10	Head Circumference	Group A	58.13	1.61	3.20	9.34304	3.6E-13 (<0.0001)
		Group B	54.93	0.97			
11	Axilla	Group A	14.06	0.90	0.90	8.703	4.1E-12 (<0.0001)
		Group B	12.32	0.62			

Figure 1: Overall Comparison



Mean of height, weight, knee joint width, knee joint circumference, elbow joint width, elbow joint circumference, *swa-anguli* width, heel width, ankle circumference, head circumference, axilla width in Group A were more than Group B, also as p value <0.05 , hence we can said that a person with *Asthi Sara Purush* has higher mean height, weight, and broader joint structures such as the knee, elbow, heel, ankle, head, and shoulder as compare to *Rakta Sara Purush* with respect to *Sandhi Praman*.

From above diagram we found that there is statistically significant difference between *Asthi Sara Purush* and *Rakta Sara Purush* with respect to *Sandhi Praman*.

Discussion

As per the study, we found that the mean height of *Asthisara* person is 180.40 cm and *Raktasara* person is 157.75 cm. This may be due to the fact that in *Asthisara Purush*, the *Asthi Dhātu* is at its best level due to proper nourishment, leading to appropriate growth. Classical *Ayurvedic* texts describe *Asthisara* individuals as having well-developed bones and a strong body framework. (17,18) Modern anthropometric and skeletal biology studies also indicate that bone mass and structure significantly influence overall body size and height. (19,20) *Asthi Agni* plays an important role in the formation of *Asthi Dhātu*, and proper functioning during puberty contributes to height gain. Puberty is a period of rapid physical development triggered by hormonal changes, where growth plates are responsible for bone lengthening. (21) Due to these combined factors, *Asthisara* individuals tend to have greater height compared to *Raktasara* individuals.

We also found that the mean weight of *Asthisara* person is 67.35 kg and *Raktasara* person is 61.29 kg. This may be due to broader skeletons and joints contributing to increased body mass. *Asthi Dhātu* provides the structural framework of the body and is responsible for maintaining posture and bearing weight. (17,18) Studies show that individuals with greater bone density and frame size tend to have higher body weight. (19,20)

We found that the mean knee joint circumference of *Asthisara* person is 37.05 cm and *Raktasara* person is 32.49 cm. Knee joint circumference is influenced by muscle mass, fat distribution, and bone size. Larger skeletal structures, including femur and tibia, contribute to increased joint circumference. Studies in musculoskeletal biomechanics confirm that bone morphology and surrounding soft tissues significantly influence joint dimensions. (22,23)

The mean knee joint width of *Asthisara* person is 10.57 cm and *Raktasara* person is 9.05 cm. Knee width depends on the size and shape of femoral and tibial condyles, which are larger in individuals with a stronger skeletal framework. (22)

The mean elbow joint width of *Asthisara* person is 6.81 cm and *Raktasara* person is 5.93 cm. Elbow joint width is influenced by anatomical variations, bone structure, and alignment. Individuals with larger skeletal build tend to have wider joints. (22,23)

The mean elbow joint circumference of *Asthisara* person is 25.97 cm and *Raktasara* person is 22.54 cm. Elbow circumference depends on joint width, arm length, and overall body size. Since *Asthisara* individuals generally have greater height and skeletal dimensions, their elbow circumference is also higher. (19,22)

The mean *Swa-anguli* width of *Asthisara* person is 1.76 cm and *Raktasara* person is 1.57 cm. This variation may be attributed to differences in metacarpal length, height, and body frame. Studies show that bone size and body proportions correlate with overall anthropometric measurements. (24,25)

The mean heel width of *Asthisara* person is 6.60 cm and *Raktasara* person is 5.19 cm. Heel width depends on genetic factors, body mass, and weight-bearing activities. Research indicates that individuals with greater body mass and skeletal strength tend to have broader feet and heels to provide stability. (23,26)

The mean ankle joint circumference of *Asthisara* person is 23.04 cm and *Raktasara* person is 22.14 cm. Ankle circumference is influenced by bone size, musculature, and overall body structure.

Since *Asthisara* individuals have broader bones and higher body weight, their ankle circumference is greater. (22,23)

The mean head circumference of *Asthisara* person is 58.13 cm and *Raktasara* person is 54.93 cm. Head circumference shows a positive correlation with height and weight. Studies in human physiology indicate that individuals with larger body size tend to have greater head circumference. (21,27)

The mean axilla width of *Asthisara* person is 14.06 cm and *Raktasara* person is 12.32 cm. The axilla is bounded by muscles and bones, and its size depends on skeletal structure. *Asthisara* individuals, having larger bones and body frame, exhibit greater axillary width. (22)

Overall, the findings of this study are consistent with classical *Ayurvedic* descriptions and modern scientific evidence. Studies correlating *Dhātu Sara Pariksha* with anthropometry have shown that individuals with stronger structural dominance exhibit greater body dimensions. (28)(29) These similarities suggest that classical *Ayurvedic* concepts like *Asthisara* can be objectively assessed using measurable anthropometric parameters.

Clinical Importance and Utility

The clinical importance of this study lies in bridging *Ayurvedic* concepts with measurable biomedical parameters, enhancing their applicability in modern healthcare. (30)(31)

Firstly, identifying *Asthisara* and *Raktasara* individuals through anthropometric measurements can aid in personalized healthcare (individualized medicine). *Ayurveda* emphasizes *Prakriti* and *Dhātu*-based assessment, and objective anthropometric parameters provide a standardized and reproducible method of evaluation. (30,32,33)

Secondly, the findings have implications in nutritional assessment and growth evaluation. Anthropometry is widely used for assessing nutritional status and identifying individuals requiring dietary and lifestyle interventions. (34,35)

Thirdly, this study is useful in orthopedic and musculoskeletal health assessment. Bone mass and skeletal strength are directly related to fracture resistance, joint stability, and risk of degenerative conditions. (36)(37) Individuals with lower structural parameters may be more prone to weakness, fatigue, osteoporosis, and joint instability. (37)(38)

Fourthly, the study contributes to preventive medicine, a core principle of *Ayurveda*. Early identification of structural differences allows implementation of dietary measures (e.g., calcium-rich diet) and lifestyle modifications such as physical activity and weight-bearing exercises to improve bone health and prevent musculoskeletal disorders. (31,35,38)

Finally, this study supports the integration of *Ayurveda* with modern research methodologies, promoting evidence-based validation of traditional concepts and enabling advances in *Ayurvedic* phenotyping and personalized therapeutics. (32,33)

Conclusion

The present study demonstrates that *Asthisāra Puruṣa* exhibit significantly greater physical dimensions than *Raktasāra Puruṣa*, including higher mean height, weight, and broader joint structures such as the knee, elbow, heel, ankle, head, and shoulder. From an *Ayurvedic* perspective, the dimensions of the joints are indicative of the status of *Asthi Dhātu* and its inherent strength, referred to as *Asthisārta*. Well-proportioned and stable joints reflect the

adequate nourishment and equilibrium of *Asthi Dhātu*, signifying excellence of *Asthisārta*. This can be attributed to the proper nourishment of *Asthi Dhātu* and the efficient action of *Asthiāgni*, which collectively contribute to optimal bone formation and growth.

Hence *Asthisara Purusha* are characterized by larger skeletal structures, broader joints, and greater body mass, ensuring enhanced stability and structural support as compared to *Raktasara Purusha*.

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