

ASSESSMENT OF *DHATU SARATA* USING C-DAC AYUSOFT: SCOPE AND CHALLENGES

¹Dr Mursida P, ²Dr Anandalakshmy K N
¹Final year PG scholar, ² Professor and Head
^{1,2}Department of Kriyasareera,

^{1,2}Government Ayurveda College, Pariyaram, Kannur, Kerala, India

Abstract:

Introduction and Background: Measurement is essential in scientific research, yet *Ayurveda* has often overlooked its importance, relying on qualitative and subjective assessments. In the era of evidence-based medicine, the lack of scientific tools for health measurements hinders the progress of *Ayurveda*. *Dhatu Sara*, the purest form of the *Dhatu*, serves as a key indicator for assessing an individual's strength. The assessment of *Dhatu Sara* lacks validated and reliable tools. Most available methods are subjective and rely on individual measurements, limiting their utility. AyuSoft, developed by C DAC, Pune, provides a standardized, computer-based tool for assessing *Dhatu Sara*, which is widely in use nowadays. This study critically reviews the AyuSoft *Dhatu Sara* assessment tool, focusing on the challenges faced during its practical application. It aims to identify and recommend necessary updates to enhance its usability and relevance for users.

Methods: The AyuSoft software was procured from C-DAC, Pune and installed on a computer. It was then used to assess the *Dhatu Sarata* of 50 individuals. Both the benefits and challenges encountered during the use of the software were thoroughly documented.

Results: The tool proved user-friendly, and integrating the *Dhatu Sara* assessment into software provides a convenient, portable solution for clinical use, removing the need for manual data analysis. However, its time-consuming nature and reliance on a highly subjective questionnaire posed challenges for routine clinical use.

Conclusion: The findings suggest that while AyuSoft is a promising step toward standardized *Dhatu Sara* evaluation, further refinements are necessary to enhance its accuracy, reliability, and practical utility in clinical settings by incorporating both user and patient perspectives.

Keywords: *Dhatu sara*, AyuSoft, Assessment tool

Introduction

Measurement plays a vital role in scientific research across the natural, social and health sciences¹. However, in *Ayurveda*, the importance of measurement has often been neglected, as Ayurvedic assessments tend to be qualitative and highly subjective. In the age of evidence-based medicine, the absence of scientific tools for health-related measurements hinders the advancement of *Ayurveda*, just as it does for any other field. Many issues related to the reproducibility or validity of subjective judgments can be addressed by employing reliable tools developed according to standard research protocols. This approach would help to standardize the diagnostic methods outlined in *Ayurveda*, enabling the field to thrive in the modern era through research based on standardized measurement tools. In this regard, the AyuSoft developed by C-DAC (Centre for Development of Advanced Computing) for assessment of *Prakrti* and *Dhatu Sara* is of particular significance.

AyuSoft is a decision support system consisting of an Ayurvedic encyclopedia, data mining tools, constitution assessment, disease diagnosis and treatment and a personal information management system². Among its features is the *Dhatu Sarata* assessment tool, which evaluates the quality of body tissues (*Dhatu*) using classical Ayurvedic principles. *Dhatu Sara* refers to the purest form of a *Dhatu* produced during the *Dhatu* formation³. *Acharya Charaka* recommended *Sara Pareeksha* for assessing an individual's strength level⁴. Strength does not always align with physical appearance, as emphasized by *Acharya Charaka* and

Ashtanga Hridaya^{4,5}. Accurate assessment of *Sara* is essential for diagnosis, treatment planning, and understanding disease resistance.

The *Ayurvedic* assessment of *Dhatu Sarata* is usually qualitative, involving detailed patient examination through observation, palpation, and interrogation. These methods, while grounded in classical Ayurvedic practices, are time-consuming, subjective, and lack standardization, posing significant challenges in clinical settings. Misinterpreting an individual's *Sara* could lead to inaccurate assessments of their *Bala*, potentially causing complications due to improper treatment⁶. AyuSoft *Dhatu Sara* Assessment Tool provides a reliable and accessible solution aimed at overcoming the limitations of traditional *Dhatu Sara* evaluation methods. This article presents a critical review of the tool, drawing from the author's hands-on experience, with a focus on identifying practical challenges and recommending enhancements to improve its usability and clinical relevance.

Methods

AyuSoft was purchased from C-DAC, Pune, under the Department of Information Technology, Ministry of Communications and Information. The software package included a CD along with a pendrive, which served as a security key for operation after installation. The pendrive was assigned a unique serial number to ensure authorized use of the software.

Upon installation and initial setup, a login name and password were created. After familiarizing with the user manual, *Dhatu Sarata* assessments were conducted for 50 individuals using the software. Informed consent was obtained from all participants, as the study was part of a Postgraduate (PG) dissertation. The participants were briefed on the study's purpose, procedures and potential benefits, ensuring their voluntary participation. During the assessment, both the benefits and challenges encountered were carefully documented. This included the software's ease of use, accuracy in providing results, and any technical or interpretive difficulties faced during the assessment.

A thorough literature search was conducted in PubMed and Scopus to identify any related measurement scales. However, only two relevant published articles were found in these databases related to the *Dhatu Sarata* measurement viz a potential method for expressing *Dhatu Sarata* using a weighted mean⁷ and the *Dhatu Sarata* Assessment Questionnaire (DSAQ)⁸. No articles were found on studies conducted using these assessment scales.

Discussion

Ayusoft

The software contains four main types of applications, each serving distinct purposes: *Vaidya Sanmitra*, *Ayur Vidyaana*, *Anveshaka*, and *Shabdha Nidhi*⁹. Various tools within the *Vaidya Sanmitra* application can be utilized in clinical scenarios, including the *Dhatu Sarata* assessment.

The installation of the *Praktivichaya* application grants access to *Vaidya Sanmitra*, which allows for person registration, selection, and modification in the *Dhatu Sarata* analysis using the *Manushavrta* tool. The *Praktivichaya* tool, a part of *Vaidya Sanmitra*, aids in assessing both physical and psychological constitution, thereby offering recommendations for diet and lifestyle. The tool includes three key assessment options: *Dosha Prakrti*, *Manasa Prakrti*, and *Dhatu Sarata*.

The software is easy to install and setup, and a user guide is provided for learning how to use it under the 'help' option in the software. It is designed to be user-friendly and administer assessments efficiently.

Dhatu Sara assessment option

The *Dhatu Sarata* assessment option involves 38 main questionnaires and a total of 165 sub-questions⁹. The questionnaire is developed based on classical guidelines for *Sara* assessment and includes specific questions tailored to age group and gender, covering physical, physiological, psychological, and social aspects. The questions mainly focus on general body and psychological characteristics, including attributes like courage, knowledge, spirituality, wealth, personality, and attitude. There are options to select *Sara* and *Asara* signs, with the ability to make multiple selections.

AyuSoft measures nine types of *Sara* – the eight *Sara* corresponding to each *Dhatu*, a *Satva Sara* representing mental faculty and *Sarva Sara* corresponding to the total *Sara* level. The nine *Sara* features and

Asara features are grouped separately, making the *Sarata* of the person easy to understand. Users simply need to tick off the relevant features and the software automatically calculates the different *Sara* scores, displaying a bar diagram of the analyzed data. This functionality removes the most complex aspect of manual analysis in research, which often lacks the structured, rule-based clarity that software-based analysis offers.

While *Dhatu Sarata* features are subjective and challenging to quantify, this software addresses that issue, providing accurate assessments of most features.¹⁰ The highest weightage is given to characteristics specific to each *Sara*. During assessments, subjective questions in *Satva Sara* assessment are allocated lower weightage. This is because the investigator cannot reliably determine the accuracy of the respondent's answers. Due to the subjective nature of these questions, the scores or weightage assigned to them are accordingly kept low. This approach allows for a more accurate assessment of qualitative data.

This questionnaire excludes middle-range options to prevent respondents from defaulting to neutral answers. However, this approach may oversimplify complex traits, forcing respondents into extreme categories. For instance, a binary response format may not accurately capture the exact data, as it only allows for 'fully' or 'not at all' answer¹¹. This limitation may lead investigators to select the 'not at all' option, despite knowing that a middle ground exists, which can compromise the accuracy of the results.

Physical attributes

The majority of the physical attributes outlined in the classical *Sara Pareeksha* are incorporated as various sub-questions in the software. Each item is designed with binary response options such as *Sthira Sareera* (steady body) or *Chala Sareera* (unsteady body), and *Samahita Sareera* (compact body) or *Asamahita Sareera* (lax body). These options are generally opposites and when one option is selected, the other is automatically locked.

In many physical attributes including skin, forehead, eyes and lips, the term *Ashobhaayamaana* (ugly/unattractive) is given as an option. Beauty and ugliness are highly subjective terms and it is very unethical and unpracticable to assess a person based on beauty or ugliness and also it is based mainly on the perspective of the examiner¹².

When assessing joint stability, the current evaluation method has a significant drawback. If all joints except one (e.g., the knee) are normal, but the knee joint is unstable, the entire assessment will be rated as unstable, unfairly penalizing the normal joints. This method fails to accurately reflect the individual joint health, leading to an oversimplification of the assessment.

Also, while assessing teeth color, only white and black options were provided, forcing those with white or mild-to-moderate yellowish teeth to select the white teeth option due to the limited choices. Although weightage configurations are adjustable, the absence of clear instructions lead to unsatisfactory results.

Psychological attributes

Assessing the psychological and social attributes of patients in an outpatient (OP) setting is a complex task. These attributes are highly subjective and influenced by both the patient and the examiner¹³. For example, evaluating psychological traits such as *Alaulya* (generosity) versus *Lolupatvam* (greediness), or *Kritajna* (gratefulness) versus *Kritaghna* (ingratitude) can be difficult during an initial consultation. Additionally, patients often present their best side when interacting with respected authorities like physicians, while they may exhibit negative characteristics outside the clinical setting. This creates a challenge, as patients are unlikely to openly admit to having negative psychological traits, such as greed, anger, or narrow-mindedness¹⁴. Consequently, responses in social contexts are often subject to bias, potentially resulting in inaccurate conclusions. This limitation, inherent in most tools used to assess psychological attributes, underscores the importance of incorporating indirect questions to enhance the validity of the measurement.

Similarly, variations in intellectual abilities, such as *Prajna* (intelligence), *Buddhi* (wisdom), *Medha* (Discriminative power), *Dhriti* (mental clarity), and *Smriti* (memory), are assessed, but most patients fall into the medium-level intellectual category. However, since the assessment typically offers predefined options like *Prajna* and *Prajna heena* (lacking intelligence) or *Buddhi*(wisdom) and *Buddhi heena* (lacking wisdom), examiners are often forced to categorize all patients as having moderate to highly positive intellectual traits, when in reality their scores should reflect a more nuanced range. The inclusion of standardized assessments, such as IQ tests, would enable more precise evaluation of these intellectual attributes. Furthermore, questions regarding longevity seem vague or irrelevant.

Dhatu Sara assessment results

The AyuSoft software integrates *Dhatu Sarata* into the *Sara* and *Asara* categories, calculating the final score by subtracting the *Asara* score from the *Sara* score. However, this method can lead to systematic errors, resulting in inaccurate scores. Also, the number of features listed for each *Sara* and *Asara* are also not equal. So, subtracting a *Sara* score from the *Asara* score may lead to the cancellation of the *Sara* score, resulting in a zero score. A zero *Dhatu Sara* score is not actually possible. AyuSoft measures nine types of *Sara*, including *Sarva Sara*, whereas *Acharya Charaka* defines only eight. Furthermore, AyuSoft does not include any reference to *Madhyama Sara*¹¹.

After the user completes the assessment, the software automatically calculates the various *Sara* scores and presents them in a table format. Under the "Charts" option, a bar graph of the analyzed data is available for viewing, providing convenient visual information.

Challenges and recommendations

Ayusoft is an innovative and widely used tool for assessing *Dhatu Sara*. By integrating the *Dhatu Sara* assessment into software, it provides a convenient and portable solution to use in clinical settings. The tool is easy to install and operate, eliminating the need for manual data analysis. The software automatically calculates individual *Sara* scores and presents them both numerically and in the form of a bar diagram.

However, the tool requires at least 30 minutes to complete, making it challenging to administer in busy outpatient clinical environments, although it may be more suitable for inpatient settings. Additionally, the questionnaire is highly subjective, posing difficulties in assessment during initial patient interactions. As a result, assessing psychological attributes proves to be highly challenging for physicians, often leading to imprecise or skewed assessments.

Conclusion

In conclusion, Ayurveda still faces a shortage of validated and reliable assessment tools, as most methods are subjective. While Ayurveda has not yet fully caught up to the scientific world in terms of standardized instruments, tools like the AyuSoft *Dhatu Sara* assessment tool hold promise for more accurate and consistent evaluations. Using reliable, standardized tools can address issues of reproducibility and validity in subjective judgments, promoting advancement in the field.

While tools like AyuSoft are innovative, they require further validation and refinement to align more closely with Ayurvedic principles and to provide a more accurate, standardized method of *Dhatu Sarata* assessment. This study underscores the need for an improved tool that can accurately assess the qualitative attributes of *Dhatu Sarata*, taking into account all physical, psychological, behavioral, and social factors, and providing a more flexible and comprehensive scoring system.

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