

Validation of Prototype Research Software– Infant Prakriti Assessment (PRS-IPA): Inferences from A Cross Sectional Pattern

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Abstract: Introduction: *Prakriti determination in an infant helps to live more healthy and prosperous life by changing their rearing plan accordingly to prevent onset of related disorders in future. Validation under this study was planned to evaluate the agreement between Infant's Prakriti Assessment questionnaire (IPAQ) and PRS-IPA (Prototype Research Software-Infant Prakriti Assessment), a software for Prakriti assessment in infants.*

Materials and methods: *A cross sectional study was carried out in Sir Sunderlal Hospital BHU and data were analyzed through two step Prakriti determination process i.e. first, by Infant's Prakriti Assessment questionnaire (IPAQ) and second by PRS-IPA. Validation was done by Spearman's Rank Correlation Coefficient and Cohen's kappa coefficient.*

Observations and Result: *In this study, Cohen's kappa coefficient was found 0.955 which is highly significant. Prakriti assessed by PRS-IPA software is valid. Validation by Spearman's Rank Correlation coefficient was also found highly significant ($p=0.000$).*

Discussion & Conclusion: *The data, derived from spearman's and kappa suggest its validity and PRS-IPA can be used for the Prakriti assessment with accuracy in infants.*

Keywords: *Ayurveda, Prakriti, Physical constitution, PRS-IPA, Infant, questionnaire, Validation, Software.*

I. INTRODUCTION

Ayurveda, 5000 years old system of medicine that has its origins from Vedic culture of India, explains the uniqueness of individuals by means of Prakriti (Physical constitution). According to this system Prakriti (Physical constitution) determines the predisposition with prognosis to diseases in addition to therapy and life-style regime.

Prakriti assessment with other factors of Dashavidha Pariksha provides total understanding of patient or healthy individuals [1]. Prakriti is sum total of physical, physiological and psychological characteristics of any individual and represents the genotype [2]. Knowledge of Prakriti can be helpful for diagnosis of diseases [3], management of disease,

[4] forecast the proneness for future disorders [5] and prevention from many chronic diseases. Knowledge of Prakriti can steer the parents for anticipation of expected disorders in their children [6].

Prakriti is a unique, but definite constant traits manifested in persons and these specific types of Doshika Prakriti can be identified in growing individuals [7].

Prakriti of an individual is fixed at the time of conception by predominance of Dosha in the Shukra (sperm) and Shonita [8] (ovum) but Acharya Charaka opines that it is not only dominance of Dosha in Shukra and Shonita but certain other factors like Kala-Garbhavahara (time factor and condition of uterus) Maturaaharavahara (diet and code of conduct of mother) and Panchamahabhuta vikara (condition of Panchamahabhuta) are also responsible for determination of Prakriti [9]. Prakriti assessment of any infants has a decisive role in maintenance of health and cure of the disease, which is the prime objective of Ayurveda [10]. In Ayurveda seven broad constitutions (Prakriti) have been described each with a varying degree of tendency to different diseases [11].

Information technology (IT) has a broad scope in up-gradation of academic, hospital and research sector of AYUSH. Information technology uses computers and software to manage patients' information. Ayurveda is restricted due to language factor for globalization; therefore there is urgent need of software in Ayurveda. Presently, questionnaire is most accepted tool to determine individual Prakriti (Physical constitution).

PRS-IPA (Prototype Research Software-Infant Prakriti Assessment) is software for Prakriti determination in infants which is prepared under the collaboration of Department of Kaumarbhritya/Bal Roga, Department of Kriya Sharir, and Department of computer science, IIT-BHU, Varanasi to save the time, reutilization of stored data for future use including individualized management and prevention of forthcoming Prakriti prone disorders [12]. Therefore, this study was planned to validate and evaluate the agreement between Infant's Prakriti Assessment questionnaire (IPAQ) and PRS-IPA (Prototype Research Software-Infant Prakriti Assessment), software for Prakriti assessment in infants.

II. MATERIAL AND METHOD

A. Objective of study: Validation and reliability of newly developed software PRS-IPA (Prototype Research Software-Infant Prakriti Assessment).

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Validation of Prototype Research Software– Infant Prakriti Assessment (PRS-IPA): Inferences from A Cross Sectional Pattern

- B.** Ethical clearance: The ethical committee clearance number was dean/2011-12/392-A dated on 12/12/2011
- C.** Population and Sample: A cross sectional study was carried out in Kaumarbhritya/Balroga, O.P.D., Sir Sunderlal Hospital, Institute of Medical Sciences (I.M.S), Banaras Hindu University (BHU) after obtaining approval from the institute ethical committee. 226 healthy infants were selected after written informed consent by parents after explaining about the study and its aims. After proper screening *Prakriti* assessment was done on 10th day of life (time of registration) in healthy state by Infant's *Prakriti* Assessment Questionnaire (IPAQ) and developed software PRS-IPA during research work. PRS-IPA software has same questions as in Infant's *Prakriti* Assessment Questionnaire (IPAQ).
- D.** Assessment of Prakriti by Questionnaire Performa: For this study, an Infant's *Prakriti* Assessment Questionnaire (IPAQ) was prepared on the basis of *Prakriti* characteristic mentioned in different textbooks of *Ayurveda* [13][14][15] [16] [17] [18] [19][20]. In questionnaire, only those *Doshika* characteristics were taken, which were possible to assess at infantile age group; while the other were excluded [21]. Infant's *Prakriti* Assessment questionnaire (IPAQ) was already validated by *Prakriti* assessing proforma of Department of Kriya Sharir [22]. Assessment was done after analysis of obtained data filled by questionnaire and physical examination of infants. All concerned characteristics were assessed by *Trividha Pariksha* of *Ayurveda* as *Darshan* (inspection), *Sparshana* (palpation) and *Prashna* (question) [23] [24].

Infant's Prakriti Assessment questionnaire (IPAQ):

Table 1: Feeding habits

S.N.	Questions	Age of Assessment	Vataja Prakriti	Pittaja Prakriti	Kaphaja Prakriti
1.	Baby like	From registration	1. Variable	1. Cold milk/Cold food	1. Warm milk/Hot food
2.	Condition of baby to feed	From registration	2. Sometimes cry sometimes no cry	2. Excessive cry
3.	Feeding per day	From registration	3. Increased frequency with variable amount	3. Increased frequency and amount	2. Less than optimum
4.	Quantity of intake per feed	From registration	4. Irregular	4. Fairly good	3. Low intake

Table 2: Bowel and urine habits

S.N.	Questions	Age of Assessment	Vataja Prakriti	Pittaja Prakriti	Kaphaja Prakriti
1.	Frequency of stool per day (in relation to consistency, smell and color)	From registration	-	Excess secretion of stool	-
2.	Frequency of urine	From 3rd month	-	Excess urination	-

Table 3: Thirst habits

S.N.	Question	Age of Assessment	Vataja Prakriti	Pittaja Prakriti	Kaphaja Prakriti
1.	Thirst (daily)	After 6 month	-	More in frequency	Less in frequency and tolerable

Table 4: Sweating habits

S.N.	Questions	Age of Assessment	Vataja Prakriti	Pittaja Prakriti	Kaphaja Prakriti
1.	Sweating	After 3 month	-	More in volume and frequency	Less in volume and frequency
2.	Smell of sweating	After 3 month	Variable	Foul smell	-

Table 5: Sleep habits

S.N.	Questions	Age of Assessment	Vataja Prakriti	Pittaja Prakriti	Kaphaja Prakriti
1.	Period of sleep in hours	From registration	Less sleep	-	More sleep

Table 6: Physical activity

S.N.	Questions	Age of Assessment	Vataja Prakriti	Pitaja Prakriti	Kaphaja Prakriti
1.	Activity level	After 3 month	Sometimes very active some time dull	-	Dull in activities
2.	Tolerance to painful stimuli (Cold)	After 6 month	Low tolerance	No tolerance	High tolerance
3.	Level of anger	After 9 month	Early onset of anger and early subside	Excess and quick onset of anger	Delayed onset of anger and late subside
4.	Attachment	After 6 month	Earl attachment and early detachment	-	Delayed attachment and delayed detachment
5.	Movement of joints, eye, lips, tongue, head, palm and sole	After 6 month	Light, fast, unsteady and early onset	-	Slow and steady
6.	After bathe	After 3 month	-	Early becomes dry	Late becomes dry

Table 7: Speech/Voice habits

S.N.	Question	Age of Assessment	Vataja Prakriti	Pitaja Prakriti	Kaphaja Prakriti
1.	Tendency to talk (as informed by mother)	After 6 month	Over talkative, irrelevant talk	Less talkative
2.	Voice quality	After 3 month	Continuous rough weak, unpleasant and hoarse	-	Affectionate voice
3.	Weather tolerance	After 3 month	Intolerance to cold	Intolerance to heat	Intolerance to cold

Table 8: Disease Incidence

S.N.	Question	Age of Assessment	Vataja Prakriti	Pitaja Prakriti	Kaphaja Prakriti
1.	Incidence of disease	After 3 month	High incidence	-	Low incidence but chronic and severe form
2.	Type of disease	After 3 month	Suffer with cold, shivering and stiffness	Ulceration in mouth	-

Table 9: Like/Dislike:

S.N.	Question	Age of Assessment	Vataja Prakriti	Pitaja Prakriti	Kaphaja Prakriti
1.	Like/dislike	After 6 month	Music and scented area	Hate sunlight
2.	Like and dislike feeding	After 6 month	Like sweet, pungent and hot food	Like sweet, bitter, astringent, cold food/drinks	Like pungent, bitter, astringent, hot and non-oily

Table 10: Body parts:

S.N.	Question	Age of Assessment	Vataja Prakriti	Pitaja Prakriti	Kaphaja Prakriti
1.	Physique	From registration	Thin, Underdeveloped ugly	Delicate Body	Compact and stable body, all organs are well developed/Good looking
2.	Skin texture	From registration	Rough and dry	Soft, moist skin with moles and pimples (neonatal acne vulgaris)	Thick, soft and oily
3.	Skin color	From registration	Dusky, luster less and dark complexion	Coppery color	Fair color like <i>Durva, Indrayava</i> and <i>Priyangu</i>
4.	Hair	After 6 month	Scanty, Thin, dry and dusky	Fine, soft, early greying or falling or no hair	Dark, thin, dense, oily. Hair are curly and blue like bees
5.	Eye color	After 6 month	Dry, Dusky, not beautiful and like dead	Coppery color and rounded	Broad, beautiful and reddish at their end angles
6.	Palm and sole	From registration	Rough and cracked	Coppery color	Thick and soft
7.	Lips	From registration	Rough and unstable	Coppery color	Broad and thick
8.	Body part	From registration	Calf muscles are small in size and hard	Joints and muscles are loose	Broad forehead, well developed, long arm and leg
9.	Nail	From registration	Rough, hard, thin, small and dusky	Coppery color	Whitish, soft and shining

Scores of *Vata*, *Pitta* and *Kapha* in infants were attained by using a 0/1 against V/P/K for each of the questions depending on a no or yes answer respectively. Cumulative scores of V, P and K are calculated through the percentage of manifested *Dosha* in infants. Criteria to define the *Prakriti* in infant, on the basis of *Dosha* percentage has been followed as per protocol [25].

E. Assessment of Prakriti by computer-aided tool (PRS-IPA):

The developed software is a complete package for helping users/ Kaumarbhritya expert (Ayurvedic Pediatrician) in analyzing infants' *Prakriti*. Platform used for development of the software is Microsoft Visual Basic 2010, Express Edition, which is a part of Visual Studio 2010package and can run in higher version too. Many components and various methods were used for developing the software [26] [27] [28]. This software also uses same questionnaire as per manual method for determination of *Prakriti* in infants.

F. Statistical analysis:

Validation of *Prakriti* assessment software (PRS-IPA) was done by Infant's *Prakriti* Assessment questionnaire (IPAQ), a newly developed Infants *Prakriti* Assessment Proforma. Validation was done by Spearman's Rank Correlation Coefficient and Cohen's kappa coefficient. Validation by Spearman's Rank Correlation coefficient was found highly significant. Level of agreement by Cohen's kappa coefficient is also significant. Kappa value was determined to perceive the consistency of results among the *Ayurvedic* pediatrician who assesses the *Prakriti* by using hard copy proforma and



Validation of Prototype Research Software– Infant Prakriti Assessment (PRS-IPA): Inferences from A Cross Sectional Pattern

questionnaire designed in software (PRS-IPA).

III. OBSERVATION & RESULT

Table 11: Validation of data gathered from the questionnaire inculcated in PRS-IPA with the manually congregated data by Spearman's rank correlation coefficient

Registered Cases (n=226)	Mean ± SD	Median	Range (Min- Max)	Correlation coefficient
V - Software (n = 226)	24.96 ± 14.67	17.67	2.42 - 68.15	0.000 (HS)
V - Questionnaire (n = 226)	26.73 ± 14.12	18.18	4.54 - 68.18	
P - Software (n = 226)	37.1 ± 19.6	41.885	10.04 - 73.91	0.000 (HS)
P - Questionnaire (n = 226)	37.97 ± 19.37	45.44	11.11 - 77.77	
K - Software (n = 226)	42.69 ± 18.29	49.4	10.71 - 76.16	0.000 (HS)
K - Questionnaire (n = 226)	42.48 ± 18.54	47.82	8.69 - 73.91	

Kappa correlation: - The kappa statistic is frequently used to test inter-rater reliability and it measures level Agreement.

Value	Approx. Significance
0.955	p= 0.000 HS

The mean ± SD of percentage of *Vata*, *Pitta* and *Kapha* was 24.96 ± 14.67, 37.1 ± 19.6 and 42.69 ± 18.29 respectively by software (PRS-IPA), while by Infant's *Prakriti* Assessment questionnaire (IPAQ), this was 26.73 ± 14.12, 37.97 ± 19.37 and 42.48 ± 18.54 respectively.

On applying correlation coefficient for assessment of *Prakriti* by software and questionnaire, significant correlation was observed in all the *Prakriti*. Details of median and minimum and maximum range of these data gathered from the software and by using Infant's *Prakriti* Assessment profoma can be seen from table number 1. When Cohen's *kappa coefficient* was applied to assess the validity of *Prakriti* assessment by software and questionnaire, its value was found 0.955 which is highly significant according to Fleiss's guidelines that means *Prakriti* assessed by PRS-IPA software is valid [29].

IV. DISCUSSION

Knowledge of *Prakriti* (Physical constitution) may go a long way in health maintenance by making one aware of suitable and unsuitable substances applicable on a one-to-one basis [30]. Now, the concept of *Prakriti* has better understood in terms of its genomic and biochemical correlations and ensuing clinical applications [31] [32] [33] [34]. PRS-IPA (Prototype Research Software-Infant *Prakriti* Assessment) is a complete package aimed at helping users (pediatricians) in analyzing *Prakriti* of infants and also assisting in differentiating the physiological features from the pathological features through basic data analysis. The developed prototype software is a complete package which

utilizes Microsoft Visual Basic 2010 Express and Microsoft Excel. Visual Basic is used as a platform for creating and working with the forms. Microsoft Excel is used for details of the patient. Results of this study suggest that newly designed tool tested in a fair number of samples is reasonably reliable and valid on statistical analysis. The *Prakriti* was first determined by Infant's *Prakriti* Assessment questionnaire (IPAQ) by manual method and after that *Prakriti* was determined by PRS-IPA software for each individual, then comparison between the IPAQ and PRS-IPA was made which revealed a highly significant agreement of 0.955 (95.5%) concordance.

V. CONCLUSION

Prakriti has decisive role in restoration of health, which is a prime objective of *Ayurveda*. Based on the results, it may be concluded that PRS-IPA is a validated tool for *Prakriti* assessment in infants which shall be helpful for data storage, time saver and accurate analysis in its determination. The analysis of *Prakriti* of an infant based on the entered data will ensure the better planning for individualized management and forecast the possibility of *Prakriti* dependent diseases in future.

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