Original Research Article

Baghel Prakash Prognosis Scoring System - Conceptual framework and preliminary psychometric validation

V. Ashwathykutty[*], V. Rakesh Narayanan

Central Council for Research in Ayurvedic Sciences, Jawahar Lal Nehru Bhartiya Chikitsa Avum Homeopathy Anusandhan Bhavan, No.61-65, Institutional Area, Opp. 'D' Block, Janakpuri, New Delhi, 110058, India

ABSTRACT

Background: The assessment of prognosis in a patient using a rigorous methodology is documented in old Ayurveda texts. But in present times, practitioners employ varied clinical assessment methods, which results in low inter-observer agreement.

Objectives: This study proposes a conceptual framework for developing a prognosis scoring system, which we refer to as the "Baghel Prakash prognosis scoring system" (BPPSS), and presents its preliminary psychometric validation.

Materials and methods: Classics of Ayurveda were extensively reviewed for item generation. Thirty-nine items were pooled initially. The Content Validity Index for Items (I-CVI), Scale-level Content Validity Index (S-CVI), and Content Validity Ratio (CVR) were calculated. The final framework contained 30 items. The scoring system was pilot-tested in a sample of 30 patients with various disease conditions. The reliability checks were done to evaluate internal consistency. Inter-item correlations, item-total correlations, and Cronbach's alpha (if an item is deleted) were used to conduct item analysis for the instrument.

Results: The framework developed includes a set of early clinical warning signs and a prognosis scoring system of 30 items with a provision for clinical adjustment of scores for selected items. Internal consistency of the scoring system during the initial psychometric validation revealed a value of .761 for Cronbach's alpha (based on standardized items), and item analysis revealed that most of the items had acceptable correlation coefficients between .3 and .7.

Conclusion: Based on this preliminary validation study, we found that this prognosis framework, based on the principles of Ayurveda, may be used in varied clinical situations. The preliminary psychometric validation experiments yielded satisfactory results. The framework also has potential in clinical research, such as selecting patients with similar prognostic scores for comparability in case and control groups of clinical trials. This tool can be utilized as a reliable outcome measure after conducting enough validation studies.

1. Introduction

A patient's prognosis is not solely reliant on the name of their illness (diagnosis). In addition to the disease-specific elements, it also depends on several patient-related aspects, such as behavioral and psychological traits, external environmental aspects, such as season and time, and societal aspects, such as the availability of attendants. Given the significance of prognosis evaluation, the various Ayurvedic scriptures described prognosis and its categories in the first few chapters [1]. For example, texts in specialized branches such as *Visha Cikitsa* (toxicology) and *Marma Cikitsa* (therapeutic manipulations of vital points of the body) begin with a description of *sadhya-asadhy*ata (prognosis) [2–4].

To better patient health, prognosis research studies the connections between future clinical patient outcomes and a predetermined baseline patient health status. [5]. Prognosis research in modern medicine is very much developed, and a considerable amount of effort is made in its various subdivisions like

fundamental prognosis research, prognostic factor research, prognostic model research, and stratified medicine research [6]. Recent research started to identify that the patient prognosis is determined more than by the diagnosis of the disease. The determining outcome depends on the interaction between disease and non-disease factors like the social, psychological, and behavioral character [7].

Even while the prognostic models for various diseases are well-established in contemporary medicine, the prognosis for a specific condition need not be the same when assessed with the principles of Ayurveda. Ayurveda can sometimes better control disease states that are amenable to surgeries and other complex treatment techniques in conventional medicine (e.g., chronic rhinitis, calculus cholecystitis) [8,9]. Hence assessing prognosis using Ayurveda principles is imperative.

Classics of Ayurveda have outlined a systematic approach to the assessment of prognosis, categorizing them into four categories *Sukha sadhy*ata (good prognosis), *Krichra sadhy*ata (difficult prognosis), *Yapya* (incurable but manageable disease), and *Asadhy*ata (poor prognosis), attributing specific criteria for each of them. However, clinical methods and the criteria used for assessing prognosis vary from clinician to clinician. Inter-observer variability poses a significant challenge in clinical care and research in Ayurveda. Developing and validating assessment tools can help standardize the clinical approach improving study designs and outcomes [10].

Here, an attempt is made to develop a prognosis scoring system based on clinical methods described in Ayurveda, which would be a first-of-its-kind attempt to structure one. The study also presents its preliminary psychometric validation. We have proposed a name for it − Baghel Prakash Prognosis Scoring System (BPPSS) - as a tribute to the renowned Ayurveda physicians, the late Professor M.S. Baghel and the late Professor Prakash Mangalasseri. The Ayurveda terminologies used in this study follow the Standard Ayurveda Terminologies given in the National AYUSH Morbidity and Standardized Terminologies Electronic Portal (NAMASTE Portal), Ministry of Ayush, Government of India [11].

2. Methodology

2.1. Item generation

Classical Ayurvedic texts such as *Brhattr*ayi (the major three Ayurvedic classics), *Laghutr*ayi (the minor three Ayurvedic classics), other relevant texts, and commentaries were extensively studied. The list of significant references used is tabulated in Supplementary Table No.1. The parameters necessary for assessing *Sadhya-asadhy*ata (prognosis) described in four categories, viz., *Sukha sadhyata* (good prognosis), *Krichra sadhyata* (difficult prognosis), *Yapya* (incurable but manageable) and *Asadhyata* (poor prognosis) were collated. A shortlist of the parameters feasible for clinical assessment and observation was made from the list, and 39 items were initially pooled.

2.2. Scoring

Specific responses were given for each item. The specific responses/options given for each item did not denote a particular prognosis category. Instead, scores were given considering their relative significance in determining *Sukha sadhyata*, *Krichra sadhyata*, and *Asadhyata*. The total score is calculated to assess the prognosis. The higher scores would point towards *Asadhyata*, and the lower scores would indicate *Sukha Sadhyata*. The weighted scores for responses have been proposed based on their relative importance in determining the prognosis as suggested by expert

physicians (during the review process of content validity) and need further validation through appropriate statistical methods in future studies. After testing the score in a large sample of patients, the specific score range for each category can be determined.

2.3. Content validity

The drafted items, along with the responses and scores, were presented to 10 expert Ayurveda clinicians across the country (Supplementary Table No. 2) for their feedback on the relevance of these items for assessing prognosis. The experts were chosen based on the following criteria:

1. Those with more than ten years of clinical experience in Ayurveda.
2. Those who have a thorough knowledge of the classical texts of Ayurveda.

Their suggestions were collected through emails and virtual meetings. The experts were requested to comment on each item drafted and suggest ways to improve them. The criteria used for the retention or deletion of an item included its clarity of expression and suitability for the measured construct. The experts commented on each item's additions, deletions, modifications, and weighted scores.

Experts evaluated the relevance of each item for the construct under the study on a four-point scale as 1. irrelevant; 2. moderately relevant; 3. relevant; 4. highly relevant. The Content Validity Index for Items (I-CVI) and Scale-level Content Validity Index (S-CVI) were computed to indicate the content validity. The items with low I-CVI were removed [12]. Content validity was also quantified using the content validity ratio (CVR). For this, the expert panel was asked to categorize each item as *essenti*al, *useful but not essenti*al, and *not necessa*ry. CVR was calculated, and the items with negative values and values lower than .62 (the minimum CVR value according to the Lawshe table) were removed [13].

The 30 items that were finalized are as follows:

1. Presence of *Arishta Lakshana* (fatal signs and symptoms)
2. Persistent nature of the disease
3. Response to treatment
4. Age
5. Sex
6. *Prakriti* (somatic constitution) of the patient
7. Chronicity
8. Effect of *Bija Dosha* (genetic abnormalities)
9. The multiplicity of etiological factors
10. Premonitory symptoms
11. Symptoms
12. Involvement of vital organs like heart, kidney, brain
13. Complications
14. *Dosha* (functional regulatory factors of the body) involved
15. *Dushya* (major structural components of the body) involved
16. Involvement of deeper *Dhatu* (major structural components of the body) viz. *Meda* (fat)/*Asthi* (Bone)/*Majja* (Bone marrow)/*Shukra* (Reproductive fluids)
17. *Ashraya Ashrayi bhava* of involved *Dosha* (relationship between *Dosha* and *dhatu*)
18. *Desha* (Habitat)
19. *Ritu* (Season)
20. Involvement of *Marma* (vital points of the body)
21. Involvement of *Sandhi* (joints)
22. *Rogamarga* (pathway of disease) involved
23. *Vyadhi sankara* (presence of co-morbidities)
24. *Agni Bala* (strength of digestive/metabolic factors)

25 *Deha bala* (body strength)
26 *Satva Bala* (mental strength)
27 Amenability only to surgical/para-surgical procedures
28 Fitness of the patient for different therapeutic measures
29 Control over senses
30 Availability of *Catushpada* (quality of four treatment limbs viz. physician, drug, attendant, and patient)

2.4. The Baghel Prakash Prognosis Scoring System

The proposed BPPSS has two sections; Sections A and B. The initial evaluation of the patient for early clinical warning signs is done in Section A. Vital clinical warning signs are included so the physician can immediately identify acutely deteriorating patients or patients with poor prognoses requiring immediate attention. If the patient does not show any early clinical warning signs, the prognostic score can be assessed in detail (Section B), indicating a good, moderately good, or poor prognosis. The scale can be used at any particular stage of the patient. However, a detailed assessment would only be possible when the patient can be assessed for various items such as *Dosha* and *Prakriti* by interrogations, palpation, and inspection.

Thirty items were included with their responses. A numerical score was given to each response of the items based on their relative significance in determining the prognosis, which needs further verification in future validation studies. BPPSS allows the physician to adjust the score based on the individual clinical assessment to make it more clinically sensitive. The sum of the individual scores gives the overall prognosis score. The scoring system is presented in Table 1.

2.5. Pilot study

A convenient sampling of 30 patients with a range of conditions was used for the BPPSS pilot study. The preliminary section of the scoring system, which checks for early warning signs, could not be assessed effectively because none of the patients were in critical clinical condition. Physicians who assessed the prognosis were asked for their comments, which were thoroughly analyzed. Patients ranged in age from 2 to 94. The reliability checks were done using the internal consistency reliability by analyzing Cronbach's Alpha values. Inter-item correlations, item-total correlations, and Cronbach's alpha if an item is deleted were used to conduct item analysis for the instrument. The analysis was done using the statistical software SPSS 15.0. The methodology is summarised in Fig. 1.

3. Results

In content validity, the I-CVI of the items ranged from 0.80 to 1.00, and the S-CVI of the scale was 0.89. The CVR for different items ranged from 0.6 to 1.00. In the pilot study, 30 patients were recruited - 15 men and 15 women. Diagnoses included *Apabahuka* (frozen shoulder), *Apraja* (primary infertility), *Ardita* (facial paralysis), *Arsha* (hemorrhoids), *Jvara* (fever), *Jvaratisara* (diarrhea due to fever), *Kampa vata* (parkinsonism), *Kushtha* (integumentary disease), *Kasa* (cough), *Khalitya* (baldness), *Nashtartava* (absence of menstrual discharge), *Prameha* (diabetes mellitus), *Shitapitta* (urticaria), *Tamaka Svasa* (bronchial asthma), *Timira* (obstruction in vision), *Udavarta Yonivyapad* (dysmenorrhea), *Apasmara* (epilepsy), *Hridroga* (heart disease), *Shira sula* (headache), *Vidradhi* (abscess). The internal consistency estimate of the tool showed a value of Cronbach's alpha of .761 (Cronbach's Alpha based on standardized items). The results of the item analysis are presented in Table No 2.

4. Discussion

Prognostic models are established in western medicine for a variety of diseases, and the majority of them are disease-specific. It may appear unscientific when we suggest a prognostic framework that can be broadly used in various medical states. However, a closer examination reveals that a patient's prognosis in Ayurveda is not based solely on a disease term. Whatever name a disease is given, Ayurveda has its unique way of comprehending it, which includes the study of several variables such as *Dosha*, *Dushya*, season, and habitat. As a result, a prognostic model incorporating all of these characteristics can accurately predict the prognosis of any illness state, regardless of its diagnosis.

The concept of the Early Warning System (EWS) score is well-established in biomedicine. The different criteria to assess the vital signs in EWS in different settings are closely followed in biomedicine [14]. The study would be a preliminary attempt in the published literature to identify and frame a set of early clinical warning signs from the perspective of Ayurveda. The proposed Ayurveda clinical warning signs would require sufficient validation studies to be used effectively in clinical settings. The items in the second part, which defines the prognosis scoring system, were carefully selected, adhering to strict clinical and preliminary statistical analysis.

While few medical tools in contemporary medicine and Ayurveda permit the clinical adjustment of the scores for the included items, BPPSS provides the physician with sufficient latitude with a provision for score modifications in a few selected items where the items may receive varied scores in various clinical circumstances. As remarks against specific items, the scoring system provided clear instructions for adjusting the score and allocating the appropriate weightage based on clinical significance.

4.1. Content validity and pilot study

In the initial phase, 10 domain experts were considered, as the clinical consensus obtained from more than 5 domain experts was considered acceptable [15]. The I-CVI value for all items was higher than the allowed limit of .78, and the S-CVI was higher than the acceptable limit of .80 [16]. The acceptable limit of CVR was calculated based on the Lawshe Table for CVR. As the number of experts in our study was 10, the acceptable limit of CVR was .62, and most of the items matched the criteria [17].

The study comprised participants of all ages, and gender distribution were kept equal. The clinical conditions of the patients tested covered different clinical specialties of Ayurveda, demonstrating its applicability in a variety of clinical situations. The scoring system performed satisfactorily in the initial psychometric assessment, and the reliability results suggested that the scale's internal consistency, as measured by Cronbach's alpha, is acceptable [18]. As the scoring system has multiple response alternatives for different items, Cronbach's Alpha based on standardized items is reported in this study (for example, one item with 3 responses, another one with 5 responses) [19].

Although some of the items (Response to treatment, Sex, *Prakriti*, Effect of *Bija Dosha* Premonitory symptoms, Complications, *Satva Bala*, Amenability only to surgical/Para surgical procedures, Fitness for different therapeutic measures, Control over senses) had lower corrected item-to-total correlation (lower than .30) [20], more than half of the retained items have total scores in the acceptable range of .30 and .70 indicating the excellent relationship of items with the construct [21]. The items with lower values were not eliminated from the score. However, they were considered for further evaluation for their method of assessment and clinical interpretation in further validation studies taking into account their theoretical importance in prognostic assessment.

Table: 1
Baghel Prakash prognosis scoring system.

Section-A: Preliminary assessment for early clinical warning signs			
S.No	Parameter	Item	Absent/Present
1	*Nadi* (Pulse)	*Sthanavicyuta* (displaced pulse)	
		Sthitva sthitva chalati (irregular pulse)	
		Atikshina (feeble pulse)	
		Atishita (very cold pulse)	
		Sthula sukshma ca (intermittent exaggerated and weakened pulse)	
2	*Jihva* (Tongue)	*Svalpakharasparsha* (mild rough appearance of the tongue)	
		Shyava/Krishnabha (blackish discoloration of the tongue)	
		Virasata (tastelessness)	
		Shushkasyatvam (dryness of the mouth)	
3	*Shabdam* (Voice)	*Avyaktam* (incoherent speech)	
		Pralapam (excess talking/irrelevant speech/incoherent speech)	
		Bhinnam (Broken voice)	
4	*Sparsham* (Touch)	*Lalate himavat svedah* (cold sweat on forehead)	
		Shitanasapradeshah (coldness of nose region)	
		Shitashvasah (cold breath)	
		Shitagatraprakampah (shaking of body with the feeling of cold)	
5	*Drishti* (Eyes)	*Jyotirvihinam* (loss of luster of eyes/loss of sight)	
		Saraktakrishnavarnam (reddish black discoloration of eyes)	
		Antargatam/Nirgatam (Sunken/Bulged Eyes)	
		Atyartham chalah/Stabdham (Excessive uncontrolled moving eyeballs/still eyes)	
		Shonah (reddish discoloration of eyes)	
6	*Shvasah* (Breathing)	*Urdhvashvasapiditam* (afflicted with shortness of breathing)	
		Krichra uchvasam (difficulty in breathing)	
		Tikshnashvasam (deep breathing)	
7	Built and Nourishment	*Balamamsashonitaparikshaya* (depletion of *māṁsa* and *rakta dhātu* as well as physical strength)	
		Bhaktachedakrishah (emaciation due to anorexia)	
		Anashnata (considerably reduced food intake)	
		Nashtagnita (loss of appetite)	
8	Sensorium and Cognition	*Aratiparitam* (afflicted with distress/restlessness.	
		Alpasamjnhah (diminished consciousness) impaired consciousness	
		Indriyanashah (impairment of sense organs)	
		Tikshnabhramam (severe giddiness/dizziness/vertigo)	
		Nashtachetanah (loss of consciousness)	
		Viparitendriyarthah (abnormal sensory perception)	
9	Other Red flag symptoms	*Atimatraraktapravrittih* (excessive bleeding)	
		Kunapagandharaktapravrittih (bleeding of blood with putrefying smell)	
		Kshinah kasamanah (person debilitated due to coughing)	
		Trishna (excessive thirst)	
		Dahah (burning sensation)	
		Malamutrasveda vibaddhata (obstruction to the passage of urine, feces, and sweat)	
		Prasaktavamih (continuous vomiting)	
		Prasaktatisaram (continuous diarrhea)	
		Bhrisham shunata (sudden onset of swelling/edema)	
		Hikka (hiccough)	
		Nakha-danta-oshtha-shyavata (blackish discoloration of nails, teeth and lips)	

| Section- B: Detailed Assessment.				
Sl.No	Parameter	Item	Score	Remarks- Adjustment by clinical assessment
1	Presence of *Arishta lakshana* (fatal signs and symptoms)	Not able to identify *Arishta Lakshana* (fatal signs and symptoms)	0	
		No	0	
		Yes	6	
2	Persistent nature of the disease	Yes	*Yapyam*	
		No	0	
3	Response to treatment	Long-lasting	0	
		Manageable with appropriate diet and medicines.	*Yapyam*	
		No response	6	
		Aggravate even with the slightest misconduct.	*Yapyam*	
		The treatment given is not proper	0	
4	Age	16–60	1	The physician can adjust the score between 1 & 3 if the age of the patient does not deserve or deserve more weightage in a specific case
		5-16 and 60-80	2	
		1-5 and above 80	3	
5	Sex	Male	1	The physician can adjust the score between 1 & 3 if the sex of the patient does not deserve or deserve more weightage in a specific case
		Female	2	
		Pregnancy	3	
		Recently delivered	4	
6	*Prakriti* (somatic constitution) of patient versus *Dosha* of disease	*Prakriti* and main *Dosha* involved have opposite qualities	1	
			2	

Table: 1 (*continued*)

Sl.No	Parameter	Item	Score	Remarks- Adjustment by clinical assessment
		Prakriti and main *Dosha* involved have similar qualities		
7	Chronicity	Less than one year	1	The physician can adjust the score between 1 & 3 if the chronicity of the disease does not deserve or deserve more weightage in a specific case
		12 yrs.	2	
		More than 2 years	3	
8	*Bija Dosha Prabhava* (Effect of genetic abnormalities)	No	1	
		Yes	6	
9	The multiplicity of etiological factors	Minimum	1	The physician can adjust the score between 1 & 4 if the number of etiological factors does not deserve or deserve more weightage in a specific case. The physician can give higher weightage even if a single etiological factor is found which is potent and highly relevant.
		Moderate	2	
		Maximum	3	
		Unidentifiable etiology	4	
10	Premonitory symptoms	Minimum	1	
		Moderate	2	
		Maximum	3	
11	Symptoms	Minimum	2	The physician can adjust the score between 2 & 6 if the number of the symptoms does not deserve or deserve more weightage in a specific case. The physician can give a higher weightage even if a single symptom is found which is severe and highly relevant.
		Moderate	4	
		Maximum	6	
12	Involvement of vital organs like heart, kidney, brain	None	0	The physician can adjust the score between 0 & 6 if the number of the vital organs does not deserve or deserve more weightage in a specific case. The physician can give higher weightage even if a single organ is involved with severe pathology
		Anyone	1	
		Two	4	
		Three	6	
13	Complications	Minimum	2	The physician can adjust the score between 2 & 6 if the number of the complications does not deserve or deserve more weightage in a specific case. The physician can give higher weightage even if a single complication is found which is severe and highly relevant.
		Moderate	4	
		Maximum	6	
14	*Dosha* (functional regulatory factors of the body) involved	One *Dosha*	1	
		Two *Dosha*	2	
		All three *Dosha*	3	
15	*Dushya* (major structural components of the body) involved	One	1	
		More than one	2	
16	Involvement of Deeper *Dhatu* (major structural components of the body) viz. *Meda/Asthi/Majja/Shukra*	Anyone	2	The physician can adjust the score between 2 & 6 if the number of the symptoms does not deserve or deserve more weightage in a specific case. The physician can give higher weightage even if a single *Dhatu* is found, but involvement is severe and highly relevant.
		Any two	4	
		Four	6	
17	*Ashraya Ashrayi bhava* of Involved *Dosha* (relationship between *Dosha* and *Dhatu*)	*Dushya* and main *Dosha* involved have opposite qualities	1	
		Dushya and main *Dosha* involved have similar qualities	2	
		More than one *Dushya* and *Dosha* involved have similar qualities	3	
18	*Desha* (Habitat)	Place and main *Dosha* involved have opposite qualities	2	
		Current Place and main *Dosha* involved have similar qualities	4	
		Both birthplace and current place have similar qualities as that of main *Dosha*	6	
19	*Ritu* (Season) (state of principal *Dosha* involved in the pathogenesis w.r.t season)	*Prashamana* (pacification of *Dosha*)	1	
		Sancaya (accumulative stage)	2	
		Kopa (provocative stage)	4	
		Not able to demarcate the season clearly	0	
20	Involvement of *Marma* (vital points of the body)	No	2	
		Yes	4	
21	Involvement of *Sandhi* (joints)	No	1	
		Yes	2	
22	*Rogamarga* (pathway of disease) involved	*Bahya*	1–6	The physician can adjust the score between 1 and 6, considering the number and type of *rogamarga* involved. More number of *Rogamarga* and involvement of *Madhyama roga marga* deserve/should carry higher scores with a tendency towards incurability
		Abhyantara		
		Madhyama		
23	*Vyadhi sankara* (presence of co-morbidities)	Yes	4	The physician can adjust the score between 1 and 4 based on the severity of the associated diseases.
		No	1	
24	*Agni bala* (strength of digestive/metabolic factors)	*Pravara*	2	
		Madhyama	4	
		Avara	6	
25	*Deha bala* (body strength)	*Pravara*	2	
		Madhyama	4	
		Avara	6	
26	*Satva Bala* (mental strength)	*Pravara*	2	
		Madhyama	4	
		Avara	6	

Table: 1 (*continued*)

Sl.No	Parameter	Item	Score	Remarks- Adjustment by clinical assessment
	Section- B: Detailed Assessment.			
27	Amenable only to surgical/Para surgical procedures?	No	1	
		Yes	2	
28	Fitness of the patient for different therapeutic measures	Tolerate all Therapeutic measures	1	
		Can tolerate some therapeutic measures	2	
		Cannot tolerate any of the therapeutic measures.	6	
29	Self-control	The patient does not overly indulge in any healthy/unhealthy practices/activities	1	
		The patient indulges in healthy/ harmless practices	2	
		The patient is overly indulged in various harmful practices	4	
30	Availability of *Catushpada* (quality of four limbs of treatment viz. physician, drug, attendant, and patient)	Availability of all *Catushpada*	1	
		Availability of some of the *Catushpada*	4	
		No availability of any of the *Catushpada*	6	

Impression of the Physician from the preliminary assessment.

Suitable for further assessment using BPPSS: Yes/No.
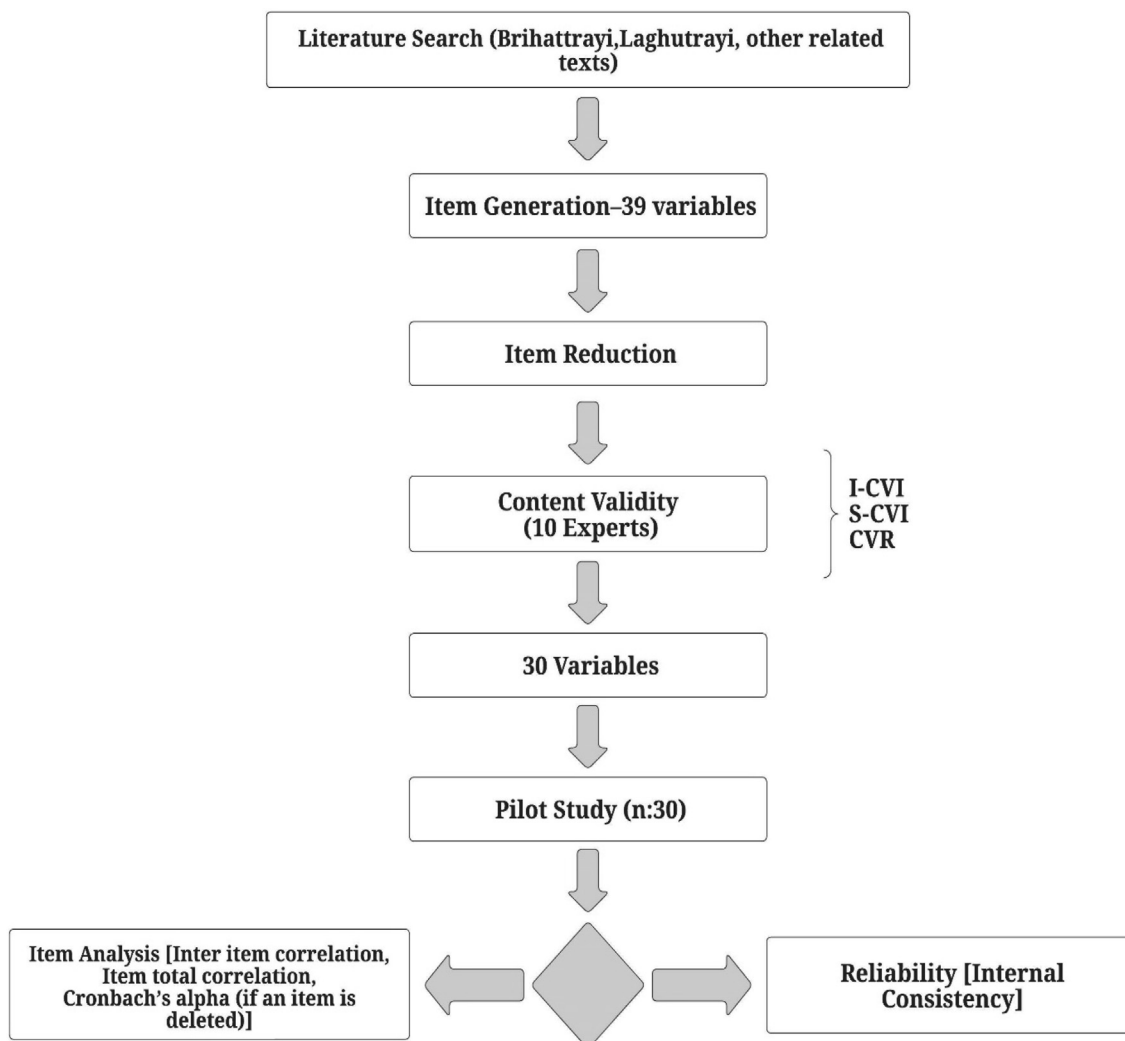
Fig. 1. Summary of methodology.

Table 2
Results of item analysis.

Item	Scale Mean if Item Deleted	Corrected Item−Total Correlation	Cronbach's Alpha if Item Deleted
Presence of *Arishta lakshana*	19.1000	.330	.675
Persistent nature of the disease	18.5000	.588	.652
Response to treatment	18.6333	.071	.706
Age	19.5667	.436	.687
Sex	19.5000	−.037	.688
Prakriti of patient versus *Dosha* of disease	19.5333	−.048	.688
Chronicity	18.8000	.500	.645
Effect of *Bija Dosha*	19.9333	.193	.676
The multiplicity of etiological factors	19.5000	.745	.638
Premonitory symptoms	19.1000	.090	.705
Symptoms	19.2000	.399	.661
Involvement of vital organs	19.7333	.358	.660
Complications	19.5333	.182	.676
Dosha	18.9667	.390	.657
Dushya	19.2333	.350	.669
Involvement of Deeper *Dhatu* viz. *Meda/asthi/Majja/Shukra*	19.4667	.440	.657
Ashraya Ashrayi bhava of involved *Dosha*	19.5667	.243	.672
Desha	19.4667	.204	.674
Ritu	19.2000	.153	.680
Involvement of *Marma*	19.8000	.483	.653
Involvement of *Sandhi*	20.0000	.344	.673
Rogamarga	18.9000	.214	.674
Vyadhi sankara	19.9000	.311	.671
Agni bala	19.2333	−.455	.694
Deha bala	19.2333	.214	.673
Satva Bala	19.1667	.090	.684
Amenability only to surgical/Para surgical procedures	19.9333	.177	.677
Fitness for different therapeutic measures	19.5000	.102	.680
Control over senses	19.8333	.154	.677
Availability of *Catushpada*	19.9000	.385	.667

4.2. Applications

Even though the assessment of prognosis is integrally done when an Ayurveda physician meticulously carries out the diagnostic decisions, this framework has been separately designed to revive and popularize the practice of assessing prognosis among Ayurveda physicians and students.

The selection of controls, a group of subjects identical to the treatment group in all aspects that affect the outcome except the intervention of interest, is a significant criterion for conducting a study in evidence-based medical research [22]. In that case, it is essential to identify controls with an equivalent prognosis for comparability. From an Ayurveda perspective, there are currently no validated tools available to assess prognosis. Therefore, in clinical studies of Ayurveda, controls with equal severity are typically chosen using modern assessment measures. When validated, the BPPSS can assess controls and cases for severity levels and help categorize patients into distinct groups based on their prognosis. Such measures help improve the future study designs and outcomes of clinical trials of Ayurveda. It can also help better analyze the results in clinical trials of Ayurveda.

4.3. Plans for validation

The score will initially be applied to a small group of patients followed up at various centers to determine its applicability and feasibility in clinical practice. This would be followed by assessing a larger group of patients in a cross-sectional study. The scoring system would also prompt physicians to actively look for some diagnostic and prognostic factors specified in the score that may not be examined during routine check-ups.

A guide for using the scoring system may be developed once the first phase of the validation process is completed. Each item would be provided with operational definitions and suitable methods for clinical identification. The assessing physicians' comments from the pilot studies and pre-tests will be addressed in the guide. The tool's reliability can be checked by inter-observer agreement. Two physicians will assess the same individual, and the final scores will be analyzed for percentage agreement and correlation coefficient.

The second validation phase will focus on examining the concurrent validity of the score, and it will be tested in a sample of patients with varying disease severity. If the scale has concurrent validity, it can distinguish between various groups of patients with variable degrees of severity.

The third phase of validation would determine the responsiveness of the score based on the longitudinal changes of the score with and without intervention, either through cohort (retrospective or prospective) studies or in clinical trials. The scoring system will be refined at each validation stage using appropriate statistical methods.

4.4. Limitations of the study

No published consensus (agreement analysis) studies regarding the methods for examining various parameters (items in the score proposed) like *Dosha* in a patient are available. Operational definitions for each item and the standardization of its evaluation can be taken up as separate studies, developing more precise guidelines through focus group discussions and clinical consensus methods. The scoring system does not fix specific numbers for each response category of etiological factors, premonitory symptoms, symptoms, and complications against particular scores because standardizing them in each illness state is beyond the scope of the study.

5. Conclusion

The BPPSS has outlined "what to look for" in prognostic decision-making. The initial psychometric validation studies of the framework yielded satisfactory results. With additional validation studies, the BPPSS framework could be transformed into a prognostic tool for various clinical applications, including patient status

assessment and subgroup classification, timely medical decision-making, and tracking patient progress in response to various Ayurvedic therapies and research.

Funding

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jaim.2022.100666.

References

[1] Sadashiva Shastri Hari, editor. Astangahrdayam of Vagbhata, Vol. 1. New Delhi: Chaukhambha Publications; 2016 [Sutrasthana, 1.29-35].

[2] Jyolsnika Visha vaidyam, Karattu Nampoothiri, Kochi bhasha parishkarana committee, Kerala sahitya Academy.

[3] Sam N, editor. Marma sastra samaharam (Malayalam) of Kanjiramkulam K Kochukrishnan Nadar. 3rd ed. Thiruvananthapuram: Kanjiramkulam K Kochukrishnan Nadar Trust; 1968. p. 670−3 (Karunadi sastram).

[4] Prayoga samuccayam of Kochunni Thampuran. Sulabha Books; 1999. p. 26−9.

[5] Hemingway H, Croft P, Perel P, Hayden JA, Abrams K, Timmis A, et al. Prognosis research strategy (PROGRESS) 1: a framework for researching clinical outcomes. BMJ 2013;346.

[6] Hemingway H, Croft P, Perel P, Hayden JA, Abrams K, Timmis A, et al. Prognosis research strategy (PROGRESS) 1: a framework for researching clinical outcomes. BMJ 2013;346.

[7] Croft P, Altman DG, Deeks JJ, Dunn KM, Hay AD, Hemingway H, et al. The science of clinical practice: disease diagnosis or patient prognosis? Evidence about "what is likely to happen" should shape clinical practice. BMC Med 2015;13:20.

[8] Chaudhari V, Rajagopala M, Mistry S, Vaghela DB. Role of Pradhamana Nasya and Trayodashanga Kwatha in the management of Dushta Pratishyaya with special reference to chronic sinusitis. Ayurveda 2010;31(3): 325−31.

[9] Metri K, Patra S, Ramakrishna KK, Salvi K, Naik J, Nagaratna R. Management of acute calculus cholecystitis with integrated Ayurveda and Yoga intervention: a case report. J Ayurveda Integr Med 2021;12(1):187−90.

[10] Edavalath M, Bharathan BP. Methodology for developing and evaluating diagnostic tools in Ayurveda - a review. J Ayurveda Integr Med 2021 Mar 4;Apr-Jun;12(2):389−97. S0975-9476(21)00010-3.

[11] Lavaniya VK, Ram TS, Narayanan VR. National AYUSH morbidity and standardized terminology portal: a short appraisal. J Res Ayurvedic Sci 2017;1: 217−20.

[12] Zamanzadeh V, Ghahramanian A, Rassouli M, Abbaszadeh A, Alavi-Majd H, Nikanfar AR. Design and Implementation content validity study: Development of an instrument for measuring patient-Centered Communication. J Caring Sci 2015;4(2):165−78. Published 2015 Jun 1.

[13] Zamanzadeh V, Ghahramanian A, Rassouli M, Abbaszadeh A, Alavi-Majd H, Nikanfar AR. Design and Implementation content validity study: Development of an instrument for measuring patient-Centered Communication. J Caring Sci 2015;4(2):165−78. Published 2015 Jun 1.

[14] Morgan RJM, Williams F, Wright MM. An early warning scoring system for detecting developing critical illness. Clin Intensive Care 1997;8:100.

[15] Zamanzadeh V, Ghahramanian A, Rassouli M, Abbaszadeh A, Alavi-Majd H, Nikanfar AR. Design and Implementation content validity study: Development of an instrument for measuring patient-Centered Communication. J Caring Sci 2015;4(2):165−78.

[16] Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations Res Nurs Health 2006;29: 489−97.

[17] Lawshe CH. A quantitive approach to content validity. Person Psychol 1975;28:563−75.

[18] Bordens SK, Babott B, editors. Research design and methods. India: McGrew Hill Higher Education; 1998. p. 418.

[19] Falk CF, Savalei V. The relationship between unstandardized and standardized alpha, true reliability, and the underlying measurement model. J Pers Assess 2011 Sep-Oct;93(5):445−53.

[20] Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best practices for developing and validating scales for health, social, and behavioral research: a primer. Front Public Health 2018;6:149.

[21] Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best practices for developing and validating scales for health, social, and behavioral research: a primer. Front Public Health 2018;6:149.

[22] Malay S, Chung KC. The choice of controls for providing validity and evidence in clinical research. Plast Reconstr Surg 2012;130(4):959−65.