

Exploration of prognostic predictors in *Vikruteha Vignaneeyam* chapter of *Ashtanga Sangraha*

Abstract

Ashtanga Sangraha is a popular Ayurvedic classical text written by Vriddha Vagbhata or Vagbhata I in Sanskrit language around 500 AD. It has earned its right place among the great treatises of *Ayurveda*. Vagbhata has compiled prognostic aspects within 4 chapters (from 9 to 12) of *Shareera Sthana* of *Ashtanga Sangraha* (SSAS). *Vikruteha Vignaneeyam* is the 10th chapter of SSAS and it is the compilation of various *Arishtha Lakshanas* pertaining to abnormal behaviour or psychomotor activity suggestive of fatal signs and symptoms explained within 35 verses. *Ashtanga Sangraha* has not received much attention and the research done in this area is negligible. The present work is aimed to analyse the contents of *Vikruteha Vignaneeyam* chapter of SSAS in terms of prognostic significance and current relevance. Contents of the *Vikruteha Vignaneeyam* chapter represent various terminal illnesses or end-of-life stages. Vagbhata has done comprehensive presentation of *Arishtha Vignana* (prognostic knowledge) with concise explanations in *Vikruteha Vignaneeyam* chapter of SSAS.

Keywords: *Arishtha Lakshana*, *Arishtha Vignana*, *Bhela Samhita*, *Charaka Samhita*, *Indriya Sthana*, *Sushruta Samhita*

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Introduction

Vriddha Vagbhata or Vagbhata I will always be praised for his contributions to Ayurveda (an ancient Indian system of medicine). Vagbhata is popular for presenting Ayurveda and its essence in a simple, easy, and comprehensible way. *Ashtanga Sangraha* is an Ayurvedic classical text written by Vriddha Vagbhata or Vagbhata I in Sanskrit language around 500 AD has earned its right place among the great treatises of *Ayurveda*. It covers all the eight specialities of *Ayurveda* unlike other Ayurvedic texts and the topics have been arranged chronologically.¹ *Ashtanga Sangraha* is the first amongst compilation works in Ayurveda. Vagbhata not only compiled the medical literature prior to him from various Ayurvedic classical texts but also he has added new methods and theories.² Commentator Indu has written a commentary in Sanskrit on *Ashtanga Sangraha*. *Ashtanga Sangraha* consists of 150 chapters that are divided among 6 sections (*Sutra*, *Sharira*, *Nidaana*, *Chikitsa*, *Kalpa Sthanas* and *Uttara Tantra*).³

Prognostic literature (*Arishtha Vignana*) and mortality indicators (*Arishtha Lakshanas*) have been documented in the last four chapters (9th to 12th) of *Sharira Sthana* of *Ashtanga Sangraha* (SSAS).⁴ In India, the art of prognosis was fully developed as evident in various Ayurvedic classical texts of ancient times. As the time passed by, *Arishtha Vignana* or Ayurvedic prognostic literature has gradually lost its popularity.² *Vikrutanga* (9th), *Vikruteha* (10th), *Vikruta Vyadhi* (11th) and *Dootadi Vignaneeyam* (12th) are the chapters of SSAS that deals with *Arishtha Vignana*.^{3,4} Prognostic literature documented in ancient Ayurvedic classical texts like *Ashtanga Sangraha* has not received much attention and the research done in this area is negligible. The present work is aimed to analyse the contents of *Vikruteha Vignaneeyam* (10th chapter) of SSAS in terms of its prognostic significance and current relevance. The present work provides a comprehensive overview, pitfalls, advantages and opportunities

pertaining to the contents documented in *Vikruteha Vignaneeyam* chapter of SSAS.

Methodology

Ashtanga Sangraha with Indu commentary in Sanskrit by Shashilekha and other commentaries in Hindi language have been referred. Other classical Ayurvedic texts including *Charaka Samhita* (with *Ayurveda Dipika* commentary by *Chakrapani*), *Sushruta Samhita* (with *Nibandha Sangraha* commentary by *Dalhana*), *Ashtanga Hrudaya* (with *Ayurveda Rasayana & Sarvanga Sundari* commentaries by *Hemadri & Arunadatta* respectively), *Kashyapa Samhita*, *Bhela Samhita*, and *Harita Samhita* have been referred for Ayurvedic prognostic literature. Published works pertaining to Ayurvedic and modern prognostic literature have been searched from various databases by using relevant key words. A search criterion has included only full text articles and abstracts published in English language. Relevant data obtained by following the above search criteria has been analyzed, interpreted and presented in the form of a narrative review.

Discussion

Arishtha Vignana has been documented in the last four chapters (from 9th to 12th) of SSAS. *Vikruteha Vignaneeyam* is the 10th chapter of SSAS and it deals with mortality indicators or fatal signs and symptoms (*Arishtha Lakshanas*) related to activities/psychomotor activities (*Cheshta*) (Table 1). The word *Eeha* or *Iha* denotes activity (physical and psychological) and/or behaviour and the word *Vikruti* denotes abnormality or pathology. Hence the word *Vikruteha* denotes abnormal physical and/or psychological activity or behaviour. This chapter consists of 35 verses.^{5,6} Each verse of *Vikruteha Vignaneeyam* chapter has been analyzed and interpreted with the help of modern prognostic literature in the following sections (Table 2).

Table 1 List of Arishta Lakshanas in Vikruteha Vignaneeyam chapter with clinical interpretation

Arishta Lakshanas	Relevant pathological condition
Vikruteha	Abnormalities in psychomotor activity; Abnormal behaviour;
Aakashamiva Yo Ghanam	Visual illusions such as aberrant perception of surface orientation or inclination or depth;
Murtam Va Amurtavat	Visual perceptual distortion (VPD); Visual illusion;
Tejasvyatejasam Pashyati	Inability to discriminate the hue or luminance of colours;
Shuklam Krishnamiva Pashyati	Scieropia; Poor colour discrimination;
Asaccha Sat Iva Pashyati	Visual hallucinations;
Chandram Bahurupam Pashyati	Polyopia;
Chandram Alanchanam Pashyati	Loss of contrast sensitivity;
Pashyati Rakshamsi Preta Gandharva Anyashcha Tadvidha	Visual hallucination with frightening content;
Na Pashyati	Visual impairment; Reduced visual acuity;
Shrunoti Shabdan Asato	Auditory hallucinations;
Na Shrunoti Shabdan Satopi Va	Sensory neural hearing loss (SNHL);
Na Shrunuyat Dhuk Dhuk Svanam	Absence of spontaneous otoacoustic emissions (SOAEs);
Gandha Manyate Viparyayat	Parosmia;
Viparyayat Manyate Rasa	Dysgeusia;
Sparsha Manyate Viparyayat	Hypoesthesia; Hyperesthesia; Paresthesia; Dysesthesia;
Sarvaso Va Na Jighrati	Anosmia;
Panshuna Avakirnango	Uremic frost;
Anga Ghatam Na Vetti	Sensory neuropathy;
Atindriyam Janati	Extra sensory perception (ESP);
Jihwa Shyava	Black hairy tongue syndrome (BHT);
Khaga Liyante	Myiasis;
Savyamakshi Nimajjati	Orbital apex syndrome;
Nikashanniva Padau	Parkinsonian gait;
Heeyate Bala	Weight loss; Fatigue; Functional decline;
Chyutamsa Parisarpati	Stooped posture with bowed head and drooped shoulders;
Deergham Shwasati	Dyspnoea;
Deergham Cheshtate	Fatigue; Higher functional impairment;
Deerghamuchwasya	Prolonged exhalation;
Vyaviddham Spandate Bhrusham	Restlessness; Agitation; Tremor;
Paritamayati	Loss of consciousness;
Shiro Vikshepate	Cervical dystonia; Head tremor; Torticollis; Anterocollis; Laterocollis;
Lalata Sruta Sweda	Focal hyperhidrosis on forehead; Craniofacial hyperhidrosis;
Shlatha Sandhana Bandhana	Flaccidity; Paralysis; Plegia;
Aanchayitva Prapanikau Krichrati	Geste Antagoniste; Sensory trick;
Uthapyamana Sammuhyet	Cerebral hypoxia; Vasovagal syncope; Benign positional vertigo;
Padau Vikaroti	Myoclonic jerks; Restless legs syndrome (RLS); Periodic limb movement disorder (PLMD);
Sammuhya	Disorientation; Semi-comatose; Delirium;
Shayanasana Kudyadau Asadeva Jigrukshti	Visual illusions; Visual hallucinations;
Ahasyhasi	Inappropriate behaviour;
Ledhi Dashanachadau	Dehydration; Electrolyte imbalance; Oral tics;
Uttaroshtham Parilihan	Oral tics;
Phutkaran Karoti	Vocal tics;
Abhidravati Chaya	Paranoid delusions;
Guru Mitradi Dvishashcha	Anger in dying patients;
Greeva, Lalata Hrudayam Swidyati Sheetalam	Focal hyperhidrosis / Craniofacial hyperhidrosis followed by hypothermia above the level of spinal cord injury (SCI);
Ushna Aparā Pradesha	Hyperthermia due to anhidrosis below the level of SCI;
Ushna & Sheetalam	Thermoregulatory dysfunction;
Anu Jyoti	Hypothermia; Hypometabolism;
Anekagro	Inattention; Agitation; Restlessness; Wandering;
Durmana	Aggression; Apathy; Depression; Psychosis;
Medha Vibhramsham & Nivartate Buddhi	Deterioration of cognitive abilities;
Shriyam Vibhramsham	Deteriorating financial capabilities;

Table I Continued...

Arishtha Lakshanas	Relevant pathological condition
<i>Upachaya Vibhramsham</i>	Unintentional loss of body weight;
<i>Shobha Vibhramsham</i>	Functional status decline; Malnutrition;
<i>Anyadhatvam Prakriti</i>	Deviation from normalcy;
<i>Nivartate Sheelam</i>	Repetitive purposeless behaviours; Verbal and physical aggression;
<i>Nivartate Smriti</i>	Memory loss;
<i>Nivartate Bhakti</i>	Personality changes; Changes in circadian rhythms, and eating behaviours;
<i>Mattavat Gati</i>	Sensory/gait/limb ataxia;
<i>Kampa</i>	Intention tremor;
<i>Mattavat Vaak</i>	Dysarthria;
<i>Moha</i>	Impairment of consciousness; Vertigo;
<i>Ajaanan Vedanaam</i>	Loss of pain sensation; Neuropathy;
<i>Na Yati Kantham Aharam</i>	Dysphagia in neuromuscular diseases (NMDs);
<i>Preshya Prateepataam</i>	Caregiver burden and/or stress in informal caregivers providing palliative and hospice care;
<i>Pretakriti</i>	Dying patient; Catatonia; Chronic bed ridden patient; End-of-life (EOL) stages;
<i>Nidra Bhavennitya</i>	Hypersomnia;
<i>Nidra Naivava</i>	Insomnia;
<i>Vaktramaapuryate Ashrunaam</i>	Epiphora;
<i>Swidyati Charanau Bhrusham</i>	Plantar hyperhidrosis; Dysautonomia;
<i>Chakshushcha Akulataam</i>	Tear film disorders; Opaque conjunctiva due to abnormal deposits;
<i>Pura Ramate Bhavai Aratistai</i>	Anhedonia; Negative symptoms of schizophrenia;
<i>Pishachadyai Upasyate</i>	Opportunistic infections in immunocompromised or dying people;
<i>Ghnanti Aushadha Veeryani</i>	Futility or non-beneficial treatments at EOL stages;

Table 2 Verses of Vikruteha Vignaneeyam chapter with clinical interpretation

Verse	Relevant clinical condition
'Athaato Vikruteha – Maharshayah' (AS. Sh. 10 / 1)	Introductory verse;
'Ghanibhutamiva – Amurtavat Sthitam' (AS. Sh. 10 / 2)	Visual perceptual distortions (VPDs); Visual illusions; Aberrant perception of surface orientation, inclination, depth and pareidolias;
'Tejasvyatejasta – Alanchanam' (AS. Sh. 10 / 3)	Visual illusions and hallucinations associated with various neurological and psychiatric illnesses;
'Jagridrakshamsi – Pashyati Sa Nashyati' (AS. Sh. 10 / 4)	Complex visual hallucinations with frightening content seen in psychosis and delirium;
'Saptarhinaam – Taam Samaam' (AS. Sh. 10 / 5)	Reduced visual acuity with high mortality risk;
'Meghatoyaugha – Na Satopi Va' (AS. Sh. 10 / 6)	Auditory hallucinations, tinnitus, sensorineural hearing loss (SNHL), presbycusis, hearing impairment and auditory neuropathy with high mortality risk;
'Nishpidya Karnau – Yo Viparyayat' (AS. Sh. 10 / 7)	Quantitative and qualitative smell & taste disorders;
'Sarvaso Va Na – Avidhina Rasa' (AS. Sh. 10 / 8)	Role of anosmia / olfactory disorders on dietary behaviour, nutritional status and quality of life of the patients;
'Ya Panshuneva – Ghatam Na Vetti Va' (AS. Sh. 10 / 9)	Morgellons disease (MD); Uremic frost; Neuropathies;
'Antarena Tapasteevram – Maranamadishet' (AS. Sh. 10 / 10)	Extrasensory perception (ESP); Hallucinations in neuropsychiatric conditions;
'Jihwa Shyava – Parivarjayet' (AS. Sh. 10 / 11)	Black hairy tongue syndrome (BHT); Acanthosis nigricans with malignancy; Rhino-orbito-cerebral mucormycosis; Sinonasal or oral or primary aspergillosis; Myiasis usually seen in immunocompromised individuals;
'Nikashanniva – Hitam Bahu' (AS. Sh. 10 / 12)	Parkinson's disease (PD) with complications and mortality;
'Yo Alpaashee – Shwasati Cheshtate' (AS. Sh. 10 / 13)	Cancer anorexia-cachexia syndrome (CACS); Hypermetabolic states; Advanced lung cancer;
'Deerghamuchwasya – Spandate Bhusham' (AS. Sh. 10 / 14)	Chronic obstructive pulmonary disease (COPD); Cerebral hypoxia; Respiratory dysfunctions with consciousness disturbances in patients with PD;
'Shiro Vikshipate – Shlatha Sandhana Bandhana' (AS. Sh. 10 / 15)	Cervical dystonia with dysautonomia; Rotatory atlanto-axial dislocation or subluxation; Tauopathies with movement disorders;
'Uthapyamana – Padau Vikaroti Cha' (AS. Sh. 10 / 16)	Vasovagal or neurocardiogenic syncope; Restless legs syndrome (RLS); Periodic limb movement disorder (PLMD);

Table 2 Continued...

Verse	Relevant clinical condition
'Shyanasana – Ledhi Dashanachadau' (AS. Sh. 10 / 17)	Somatosensory or haptic object perception impairments in patients with delirium;
'Uttaroshtam Parilhan – Peeta Arunapi Va' (AS. Sh. 10 / 18)	Psychotic disorders associated with movement disorders; Schizophrenia with Tourette's syndrome (TS);
'Bhishagbhesaja – Samavartina' (AS. Sh. 10 / 19)	Anger in dying patients;
'Greeva Lalata – Sharanam Tasya Devata' (AS. Sh. 10 / 20)	Shapiro's syndrome (SS); Reverse SS; Spinal cord injury (SCI);
'Yo Anu Jyoti – Nopabhunjate' (AS. Sh. 10 / 21)	Delirium; Behavioural and psychological symptoms of dementia (BPSD);
'Nirnimitam Cha – Yamakshayam' (AS. Sh. 10 / 22)	Neurodegenerative diseases; Near death experiences (NDEs);
'Gunadoshamayee – Na Sa Jeevati' (AS. Sh. 10 / 23)	Organic pathologies; Personality or behavioural changes in psychosis or neurodegenerative diseases;
'Bhakti Sheelam – Marishyata' (AS. Sh. 10 / 24)	Major neurocognitive disorders;
'Mattavadgati – Vedanaam' (AS. Sh. 10 / 25)	Ataxia; Delirium; PD; Neurodegenerative and demyelinating diseases;
'Na Yati Yasya – Pretakrutirudiryate' (AS. Sh. 10 / 26)	Dysphagia in neuromuscular diseases (NMDs); Caregiver burden/stress in informal caregivers providing end-of-life care;
'Yasya Nidra – Charanau Bhrisham' (AS. Sh. 10 / 27)	Circadian rhythm sleep-wake disorders in neurodegenerative conditions;
'Vaktramaapuryate – Gamishyata' (AS. Sh. 10 / 27&28)	Ocular sarcoidosis and neurosarcoidosis;
'Yai Pura Ramate – Na Jeevati' (AS. Sh. 10 / 28)	Anhedonia in major depressive disorder (MDD); Negative symptoms of schizophrenia;
'Kathayet Na – Chikitsitum' (AS. Sh. 10 / 29)	Policy while delivering bad news to the dying patients/family members;
'Yamadoota – Parivarjayat' (AS. Sh. 10 / 30)	Opportunistic infections in immunocompromised patients; Futility of treatment in patients with terminally illness or at the end-of-life stages;
'Arishtam Nasti – Tu Mrutyave' (AS. Sh. 10 / 31-34)	Classification of <i>Arishta Lakshanas</i> ; Strong association between two variables (<i>Arishta Lakshanas</i> and death);
'Ayurveda Phalam – Bhavedbhisak' (AS. Sh. 10 / 35)	Scope of <i>Arishta Vignana</i> ;

(AS. Sh. 10 / XX):AS, Ashtanga Sangraha; Sh, Sharira Sthana; 10, 10th chapter; XX, Verse number

Athaato Vikruteha Vignaneeyam Adhyayam -- Maharshayah (Verse 1)

The word *Vikruti* denotes either death (*Maranam*) or abnormality or pathology and the word *Eeha* or *Iha* denotes physical activity or psychomotor activity or behaviour. *Vikruteha Vignaneeyam* chapter deals with various mortality indicators (*Arishta Lakshanas*) pertaining to physical activity or behaviour (*Cheshta*).^{5,6}

Ghanibhutamiva -- Amurtavat Sthitam (Verse 2)

Perceiving (*Pashyati*) sky (*Aakasham*) as a hard or dense object (*Ghanibhutamiva*) and vice versa (*Aakashamiva Yo Ghanam*); shapeless or formless things (*Amurtam*) as real objects (*Murtam*) and vice versa (*Murtam Va Amurtavat*) in the absence of ophthalmological disease (*Anetra Roga*) is considered fatal (*Nashyati*).⁵ The present verse is the compiled version and it is taken from *Indriyaaneekam* chapter of *Charaka Indriya Sthana* (CIS).⁷ The present verse denotes visual perceptual distortions (VPDs) or complex visual illusions seen in various psychiatric and neurological illnesses such as depression, mania, substance abuse, schizophrenia, migraine, dementia, delirium, epilepsy, tumour, and stroke.⁸ Visual illusions are the complex

phenomenon in which one object is perceived as another kind of object (*Aakashamiva Yo Ghanam* or *Murtam Va Amurtavat*). In simple visual illusions, either any one of the features including shape, colour, distance, size, motion, number, tilt, or the temporal aspect is altered. Both simple and complex visual illusions are seen in Parkinson's disease (PD), regional brain injury, migraines and epileptic seizures. Visual illusions such as dysmorphopsia (shape of the object appears differently from reality), metachromatopsia (colour of the objects appears differently from reality), textural illusions (surface of the object appears differently from reality), diplopia (double vision), micropsia & macropsia (objects perceived smaller or larger than in reality), teleopsia & pelopsia (objects perceived more distant or nearer than in reality), kinetopsia & akinetopsia (stationary objects perceived as moving or moving objects perceived stationary), Zeitraffer & Zeitlupen phenomena (objects perceived moving faster or slower than in reality), upside-down illusion (objects appear inverted), tilt illusion (objects appear as tilted), aberrant perception of surface orientation (inclination) and depth etc are seen in PD.

In patients with PD, visual illusions such as perceiving the ground or room floor as they are going downhill (*Aakashamiva Yo Ghanam*)

can be seen. Orientation of surface appears different from that in reality (*Aakashamiva Yo Ghanam*) is also a form of visual illusion. Pathologies affecting general depth perception including planar tilt may manifest due to the dysfunction of the intraparietal sulcus. The sites of brain lesions that are responsible for various visual illusions are temporo-parieto-occipital junction, the angular gyrus, superior parietal lobule, occipitotemporal cortex, secondary visual cortex etc.⁹ Pareidolias are the illusions characterized by perceiving meaningful objects (animals and faces) from ambiguous forms embedded in visual scenes. Patients with dementia with Lewy bodies (DLB) usually perceive a much larger number of pareidolias.¹⁰ The present verse denotes visual illusions such as aberrant perception of surface orientation or inclination or depth and/or pareidolias.

Tejasvyatejasta -- Alanchanam (Verse 3)

Perceiving (*Pashyati*) bright objects (*Tejas*) as dull (*Atejas*); white coloured objects (*Shuklam*) as black (*Krishnam*); perceiving objects (*Sat*) in their absence (*Asat*); perceiving multiple images (*Bahurupam*) of a single object such as moon (*Chandram*); and perceiving moon (*Chandram*) as spotless (*Alanchanam*) in the absence of ophthalmological disease (*Anetra Roga*) indicates an imminent death (*Nashyati*).⁵ The present verse is taken from the *Indriyaaneekam* chapter of CIS. *Tejasvyatejasam Pashyati* means perceiving bright objects as dull and it indicates the inability to discriminate the hue or luminance of colours. Patients with achromatopsia (loss of colour vision) may complain that the world appears as if it has been drained of colour (*Atejas*) and even bright (*Tejas*), saturated colours look pale (*Atejasam Iva Pashyati*). Scieropia is characterized by darkening of vision i.e., vision is dimmed and seeing everything at twilight (*Tejasvyatejasam & Shuklam Krishnamiva Pashyati*) occurs due to diffuse occipital damage.⁷ Abnormal visual perceptual experiences especially perception of size, contrast, orientation, motion and luminance (*Tejasvyatejasam Pashyati*) are commonly seen in patients with schizophrenia.¹¹ Visual illusions such as contrast-contrast and luminance (*Tejasvyatejasam Pashyati*) are seen in patients with schizophrenia. Schizophrenia patients have difficulty in distinguishing boundaries between the two different contrasts. Anomalies of perception may be a feature of prodromal psychosis and for at-risk mental states. VPDs and visual hallucinations (*Asaccha Sat*) are commonly seen in neurological disorders such as migraine and PD.¹² Visual symptoms are common in PD and include double vision (*Chandram Bahurupam Pashyati*), poor contrast sensitivity (*Chandram Alanchanam Pashyati*), problems with colour vision (*Shuklam Krishnamiva Pashyati*), blurring of vision and lowered acuity. Early presence of visual hallucinations (*Asaccha Sat Iva Pashyati*) is a strong predictor of cognitive decline, increased mortality (*Nashyati*) and reduced quality of life for patients with Parkinson's disease dementia (PDD).¹³

Contrast sensitivity is the ability to discriminate an object from its background (for example to discriminate the figure of hare in the moon) and is affected (*Chandram Alanchanam Pashyati*) by lesions in the retina, thalamus or cortical locations (*Nashyati*). Loss of contrast sensitivity (*Chandram Alanchanam Pashyati*) in patients with PD eventually deteriorates as the disease advances (*Nashyati*). Disordered colour discrimination (*Shuklam Krishnamiva Pashyati*) is seen in patients with PD and it correlates with cognitive performance and with changes in white matter of posterior brain structures (*Nashyati*). Inabilities in figure-ground discrimination task (recognizing figures embedded in more complex figures such as discriminating the figure of hare in the background of moon - *Chandram Alanchanam Pashyati*) are seen in patients with PD especially in those with

more advanced disease (*Nashyati*). Decreased colour (*Shuklam Krishnamiva Pashyati*) and depth perception (*Aakashamiva Ghanam*) may indicate reduced grey matter volume in visual association areas (*Nashyati*). Visual hallucinations (*Asaccha Sat Iva Pashyati*) with impaired contrast sensitivity (*Chandram Alanchanam Pashyati*) and colour vision (*Shuklam Krishnamiva Pashyati*) are seen in PDD, DLB, multiple system atrophy (MSA) and progressive supranuclear palsy (PSP) and indicate worsening of visuo-perceptual processing with disease progression and mortality (*Nashyati*).¹⁴ VPDs frequently accompany neurodegenerative disorders including PD, Alzheimer's disease (AD) and Huntington's disease (HD).¹⁵ Visual impairments such as decreased visual acuity, reduced contrast sensitivity (*Chandram Alanchanam Pashyati*), poor colour discrimination (*Shuklam Krishnamiva Pashyati*), visual field loss, abnormalities in motion and depth perception (*Aakashamiva Ghanam*) and stereopsis are seen in AD.¹⁶ Polyopia is a disorder of cerebral function in which an object is perceived (*Pashyati*) as duplicated twice or multiple times (*Bahurupam*) and occurs mostly due to the lesions of the visual association cortex (*Nashyati*).¹⁷ *Chandram Bahurupam Pashyati* denotes cerebral polyopia. The present verse denotes visual illusions and hallucinations associated with various neurological and psychiatric illnesses.

Jagridrakshamsi -- Pashyati Sa Nashyati (Verse 4)

Seeing (*Pashyati*) demons (*Rakshamsi*), celestial beings/musicians (*Gandharva*), ghosts (*Preta*) and any other such threatening beings (*Anyashcha Tadvidhan*) while wakefulness (*Jagruta*) denote an imminent death (*Nashyati*).⁵ Similar verse is mentioned in *Indriyaaneekam* chapter of CIS.⁷ The present verse denote visual hallucinations commonly seen in various neurological and psychiatric conditions such as epilepsy, occipital and temporal lobe lesions, schizophrenia, mood disorders, delirium, migraine, dementia, Charles Bonnet syndrome (CBS), Creutzfeldt-Jakob disease (CJD), Anton's syndrome, PD, inborn errors of metabolism etc associated with mortality (*Nashyati*). Visual hallucinations with frightening content (*Rakshasa, Preta* and *Anyashcha Tadvidhan*) are found in psychotic disorders and delirium (end-of-life stage - *Nashyati*).⁷

Saptarhinaam -- Taam Samaam (Verse 5)

A person, who is unable to see (*Na Pashyati*) *Arundhati* star, Polar star (*Dhruva Nakshatra*) near *Saptarshi* constellation and the milkyway galaxy (*Akasha Ganga*) will die (*Nashyati*).⁵ Similar verse is mentioned in *Gomaya Churneeyam* chapter of *Bhela Indriya Sthana*¹⁹ and *Panchendriyarth Vipratipatti* chapter of *Sushruta Sutra Sthana*.²⁰ The present verse denotes reduced visual acuity or vision impairment associated with mortality.¹⁹ Visual impairment is associated with social isolation, depression, poor well-being, frailty, functional decline, decline in instrumental activities of daily living (IADL) and increased mortality risk (*Nashyati*). Reduced visual acuity (*Na Pashyati*) has direct and indirect influences (by potential biological and functional mechanisms) on mortality risk (*Nashyati*).²¹

Meghatoyaughha -- Na Satopi Va (Verse 6)

A person, who hears (*Shrunoti*) a wide variety (*Anyamshcha*) of sounds (*Shabdan*) in their absence (*Asato*) such as sound of the clouds / thunder sounds (*Megha Nirghosha*) and sound of flowing water (*Toyaughha Nirghosha*); sounds of musical instruments such as Lute (*Veena*), drums (*Panava*) and flute (*Venu*); and unable to hear the above sounds (*Na Shrunoti Shabdan*) in their presence (*Satopi Va*) indicates an imminent death (*Maranamadishet*).⁵ The present verse is composed from the verses (15-23) of *Panchendriyarth Vipratipatti* chapter of *Sushruta Sutra Sthana* and it denotes auditory hallucinations, tinnitus,

sensorineural hearing loss (SNHL), presbycusis, hearing impairment and auditory neuropathy associated with mortality risk.²⁰ Auditory hallucinations (AHs) are auditory experiences (*Shrunoti Shabdan*) that occur in the absence of corresponding external stimuli (*Asato*).²² It is not clear whether the hearing impairment is linked to AHs and auditory sensory deficits result in AHs till date.²³ AHs (*Shrunoti Shabdan Asato*) in elderly subjects with hearing impairment (*Na Shrunoti Shabdan Satopi Va*) have represented a broad spectrum of phenomenology ranging from simple (such as buzzing or humming) (*Megha Toyaugha Nirghosha*) to complex (musical) precepts (*Veena Panava Venujan*).²⁴ AHs (*Shrunoti Shabdan Asato*) are found in a wide range of clinical disorders including schizophrenia, substance abuse, mood disorder, borderline personality disorder (BPD), PD, epilepsy, dementia, dissociative disorder, and hearing impairment (*Na Shrunoti Shabdan Satopi Va*).²⁵

Damage to the central and peripheral auditory systems is one of the causes for hearing loss (*Na Shrunoti Shabdan Satopi Va*). The main causes of SNHL are degenerative processes, noise exposure, drugs having ototoxic side effects, and chronic conditions.²⁶ Hearing impairment (*Na Shrunoti Shabdan Satopi Va*) is associated with social isolation, depression, cognitive decline, dementia and high risk of mortality (*Maranamadishet*).²⁷ Tinnitus is the perception of sound (*Shrunoti Shabdan*) in the absence of an actual external sound (*Asato*). The sounds in tinnitus are described as being similar to crickets, cicadas, falling tap water (*Toyaugha Nirghosha*), winds, escaping steam, grinding steel, running engines, fluorescent lights etc. Tinnitus occurs due to the abnormal neuronal activity in auditory pathway at a subcortical level. Tinnitus (*Shrunoti Shabdan Asato*) is also known to be associated with hearing loss (*Na Shrunoti Shabdan Satopi Va*).²⁸ The present verse denotes hearing loss or impairment associated with auditory hallucinations or tinnitus due to an underlying systemic disease with high mortality risk.

Nishpidya Karnau -- Yo Viparyayat (Verse 7)

If a person is unable to hear (*Shrunuyat Na*) the sounds (*Dhuk Dhuk Svanam*) when both ears are closed/plugged (*Nishpidya Karnau*); altered perception (*Viparyayat Manyate*) of smell (*Gandha*), taste (*Rasa*) and sensory information (*Sparsha*) denotes an imminent death (*Maranamadishet*).⁵ The present verse is taken from *Indriyaaneekam* chapter of CIS. There are different names for those sounds heard normally (*Dhuk Dhuk Svanam*) when both the ears are plugged (*Nishpidya Karnau*), noises produced by the contractions of tensor tympani muscles, physiological tinnitus, sounds of spirit, spontaneous autoacoustic emissions (SOAEs), phantom noises and *Nada* (inner sound).⁷ SOAEs (*Dhuk Dhuk Svanam*) vary in number, frequency and level.²⁹ SOAEs decrease in frequency as the age advances (*Maranamadishet*).³⁰ Otoacoustic emissions (OAEs) (*Dhuk Dhuk Svanam*) may be absent (*Shrunuyat Na*) if there is a compromise to the blood flow to the cochlea due to impingement of internal auditory artery by a retrocochlear mass (*Maranamadishet*). OAEs (*Dhuk Dhuk Svanam*) may also disappear (*Shrunuyat Na*) over time in patients with auditory neuropathy spectrum disorder ANSD (*Maranamadishet*).³¹ Inability to hear the sounds when both the ears are plugged may denote either an inner ear pathology or circulatory or neurological pathology associated with fatal outcome.⁷

Gandha Manyate Viparyayat denotes parosmia (wrong perception of odours). Life expectancy seems to be negatively associated (*Maranamadishet*) with olfactory dysfunctions. Odour sensations in parosmia and phantosmia are usually described as unpleasant (*Manyate Viparyayat*). The main causative factors for olfactory disorders are trauma (due to the contusion of orbitofrontal cortex), viral infections, nasal causes, aging and neurological illnesses

(PD, AD, DLB, MSA, corticobasal degeneration-CBD, PSP, spinocerebellar ataxia-SCA, HD and motor neuron disease-MND) (*Maranamadishet*). *Viparyayat Manyate Rasa* denotes dysgeusia (an impaired taste sensation). Taste stimuli are (*Rasa*) perceived (*Manyate*) differently than normal (*Viparyayat*), and often as bitter or metallic. The main causative factors for taste disorders are head injury, upper respiratory tract infections, iatrogenic, toxic and burning mouth syndrome (BMS). Sweet dysgeusia is seen in patients with lung tumours (*Maranamadishet*).³² *Sparsha Manyate Viparyayat* denotes various conditions such as hypoesthesia (reduced touch appreciation), hyperesthesia (exaggerated touch sensation), paresthesia (abnormal sensations perceived without specific stimuli), and dysesthesia (painful sensations elicited by non-painful stimuli). Neuropathies, infections, lesions of the spinal cord, parietal cortex, brainstem and thalamus and other neurological illnesses (*Maranamadishet*) may produce altered or distorted tactile sensations (*Viparyayat Manyate Sparsha*).³³ The present verse denotes various conditions including quantitative and qualitative smell & taste disorders and neurological illnesses with high mortality risk.

Sarvasho Va Na -- Avidhina Rasa (Verse 8)

A person (*Yo*), who is unable to perceive (*Sarvasho*) the odour (*Na Jighrati*) completely; unable to perceive the odour (*Na Jighrati*) when oil lamp extinguishes (*Deepa Gandham*); deterioration of health status (*Doshaya*) with nutrient rich diet (*Vidhina Rasa*) and vice versa (*Swasthyaya Avidhina*) are considered as *Arishtha Lakshanas*.⁵ Lack of proper olfaction (*Sarvasho Va Na Jighrati*) is known to be associated with weight loss (*Vidhina Doshaya*) and weight gain (*Swasthyaya Avidhina*). Low quality of life (*Maranamadishet*) is characteristic feature in patients with olfactory disorders (*Sarvasho Va Na Jighrati*). Total anosmia is characterized by an inability to perceive all odours (*Sarvasho Na Jighrati*) and partial anosmia is an inability to perceive some (*Deepa Gandham Na Jighrati*) but not all odours (*Va Na Jighrati*). Trauma or malignancy of the nose, nasopharynx and paranasal sinuses, infections (viral, fungal and bacterial), epilepsy, migraine, multiple sclerosis (MS), PD, AD, diabetes, Addison disease, Cushing syndrome, hypothyroidism, chronic renal disorders and liver diseases are known to be associated with various olfactory disorders (*Na Jighrati*).³⁴

People with smell (*Sarvasho Va Na Jighrati*) and taste disorders (*Viparyayat Manyate Rasam*) have reported a decreased appreciation of food and loss of appetite (*Doshaya*), though this may not necessarily lead to changes in intake of food, healthy eating patterns (*Vidhina Rasa*) and nutritional status. Afflicted individuals may change their preferences to food by using non-olfactory sensations to maintain food enjoyment (*Avidhina Rasa*), which may result in weight gain (*Swasthyaya*). Conversely, patients with olfactory impairment may lose interest in food (*Doshaya*), preferring healthy food choices (*Vidhina Rasa*), or in the negative, lose weight (*Doshaya*). As individuals may respond differently (*Doshaya & Swasthyaya*) to the olfactory impairment (*Sarvasho Va Na Jighrati*), it is important for clinicians to assess the impact of measured and/or perceived impairment (*Swasthyaya & Doshaya*) on the patient's nutritional status (*Swasthyaya & Doshaya*) and eating behaviors (*Vidhina & Avidhina*). More research is required for better understanding the impact of anosmia / olfactory disorders on dietary behaviour of the patients and to which extent these changes affect their nutritional status and health.³⁵

Ya Panshuneva -- Ghatam Na Vetti Va (Verse 9)

Sensation of dust or sand (*Panshuna*) smeared all over the body (*Avakirango*) and complete loss of pain sensation (*Anga Ghatam*)

Na Vetti) are considered as *Arishta Lakshanas*.⁵ The present verse is taken from *Panchendriyarth Vipratipatti* chapter of *Sushruta Sutra Sthana*.²⁰ Morgellons disease (MD) is a skin condition characterized by multicoloured filaments either protruding out from the skin or embedded within the skin and formication (crawling, biting, creeping, stinging sensations) (*Panshuna Avakirnango*).³⁶ Grains of sand (*Panshu*) have been found in the specimens of patients with MD.³⁷ *Panshuna Avakirnango* denotes either MD or uremic frost. Complete loss of pain sensation (*Anga Ghatam Na Vetti*) seen in various neuropathies, sensory neuronopathy, metabolic disorders, toxins, vasculitis, infections, radiculopathy, diabetes, vitamin B₁₂ deficiency, ganglionopathy etc. conditions associated with high mortality risk (*Anga Ghatam Na Vetti*).²⁰

Antarena Tapasteevram -- Maranamadishet (Verse 10)

If a person (*Yashcha*) is able to perceive things (*Janati*) beyond his/her sensory capabilities (*Atindriyam*) in the absence of (*Antarena*) special powers achieved by *Yogic* practices (*Yogam Vidhipurvakam*) or severe (*Teevram*) penance (*Tapa*), indicates an imminent death (*Maranamadishet*).⁵ The present verse is taken from *Indriyaaneekam* chapter of CIS and it denotes extrasensory perception (ESP). ESP is considered as paranormal phenomena. ESP is characterized by perceiving internal stimulations as external objective stimuli mistakenly and/or hallucinatory perceptions. Hallucinations, Out-of-body experiences, synesthesia, enhanced awareness, psychedelic & paranormal phenomena and mystical experiences come under the domain of altered states of consciousness (ASC). The above verse may denote ESP or hallucinations associated with various neurological and psychiatric conditions including schizophrenia, mood disorders, substance abuse, dementia, delirium, BPD, Post traumatic stress disorder (PTSD), AD, PD, DLB, sleep disorders etc.⁷

Jihwa Shyava -- Parivarjayet (Verse 11)

A person having blackish tongue (*Jihwa Shyava*), bad smell from mouth (*Mukham Puti*), and skeletonised or sunken (*Nimajjati*) left eye (*Savyam Akshi*); head myiasis (infection with a fly larva/maggots) (*Khaga Murdhni Liyante*) will eventually die (*Parivarjayet*).⁵ The first line of the present verse (*Jihwa Shyava Mukham Puti Savyamakshi Nimajjati*) is taken from *Chaaya vipratipatti* chapter of *Sushruta Sutra Sthana*³⁸ and the second line (*Khaga Murdhni Liyante Yasya Tam Parivarjayet*) is the contribution of *Vagbhata*. The present verse denotes fatal conditions such as fungal infections in cancer or immunocompromised patients, black hairy tongue syndrome (BHT) (*Jihwa Shyava*), acanthosis nigricans (with malignancy) etc. Rhino-orbito-cerebral mucormycosis is characterized by oral signs (*Jihwa Shyava*), paranasal and nasal sinus mucosa (*Mukham Puti*), orbital signs (*Savyamakshi Nimajjati*), and intracranial extension (*Parivarjayet*). Blackish discoloration of the palate (*Jihwa Shyava*) with perforation and necrosis (*Mukham Puti*) in mucormycosis denotes worsening of the disease and poor prognosis (*Parivarjayet*). Involvement of the orbit may cause orbital apex syndrome (*Savyamakshi Nimajjati*). The present verse may also denote conditions such as sinonasal or oral or primary aspergillosis also.³⁸ Myiasis usually seen in immunocompromised individuals. Cases of recurrent rhinomaxillary mucormycosis (*Jihwa Shyava Mukham Puti Savyamakshi Nimajjati*) with myiasis (*Khaga Liyante*) have been reported.³⁹

Nikashanniva -- Hitam Bahu (Verse 12)

A person dragging both the feet while walking (*Nikashanniva Padau*), walking with dropped shoulders (*Chyutamsa Parisarpati*) and having weight loss or fatigue or functional decline (*Heeyate Bala*) in spite of proper nutritious diet (*Annamashnan Hitam Bahu*)

indicates an imminent death.⁵ The present verse is taken from verse 4 & 8 of *Gomaya Choorneeyam* chapter of CIS and it denotes PD.⁴⁰ *Nikashanniva Padau* denotes shuffling or festination or hastening or propulsive or Parkinsonian gait; *Chyutamsa Parisarpati* denotes gait with stooped posture with bowed head and drooped shoulders. Risk of falls due to loss of postural balance is seriously disabling in patients with PD and it is associated with high risk of mortality (*Maranamadishet*). The patient not responding to the nutritious diet (*Annamashnan Hitam Bahu*) and continue to lose weight (*Heeyate Bala*) indicates irreversible and gradually progressive pathological conditions, multi organ failure, terminal illness with cachexia etc seen usually at the end-of-life (EOL) stages.⁴⁰ Weight loss, malnutrition, sarcopenia and cachexia are seen in patients with PD. Weight loss and increased energy expenditure (due to motor symptoms) are associated with PD.⁴¹ The present verse denotes PD associated with complications and mortality.

Yo Alpaashee -- Shwasati Cheshtate (Verse 13)

Increased volume of urine (output) (*Bahu Mutra*) and an increased stool quantity (*Bahu Vit*) despite undereating (*Alpaashee*) and vice versa (*Bahvashee Alpa Mutra Vit*); a person having *Kaphaja* disease with undereating (*Alpaashee*), difficulty in breathing (*Deergham Shwasati*) and fatigue or asthenia (*Deergham Cheshtate*) indicates an imminent death (*Maranamadishet*).⁵ The first line of the present verse (*Yo Alpaashee Bahuvinnutro Bahvashee Chalpamutravit*) is taken from *Pannarupeeyam* chapter of CIS.⁴² The second line of the present verse (*Yovalpaashee Kaphenarto Deergham Shwasati Cheshtate*) is the novel contribution of *Vagbhata*.⁵ The dietary intake of food and fluid (*Alpaashee & Bahvashee*) is the major cause of variation in both the fecal (*Vit*) and urine (*Mutra*) quantity (*Alpa & Bahu*) and composition. Energy intake can act as a measure of food intake (*Alpaashee & Bahvashee*). Food intake (*Alpaashee & Bahvashee*) and body weight therefore have an influence over fecal weight (*Alpa & Bahu Vit*). Urine output (*Alpa & Bahu Mutra*) is used to assess circulatory adequacy.⁴³ The energy-balance equation is defined by the equilibrium of energy intake (*Alpaashee & Bahvashee*) and expenditure. Energy loss in stools (*Bahu Vit*) and urine (*Bahu Mutra*) is one of the components of energy-balance equation. An altered nutrient load (*Alpaashee & Bahvashee*) induce changes in the bacterial composition of the human gut microbiota and these changes are directly associated with stool energy loss (*Alpa & Bahu Vit*).⁴⁴ The present verse may denote altered food intake, energy imbalances and altered urine and faeces output associated with cancer anorexia-cachexia syndrome (CACS).

Decreased food intake (*Alpaashee*) and multi-organ energy imbalance (as evident by *Alpa Mutravit*, *Bahu Mutravit* and *Deergham Cheshtate*) in cancer patients worsen the cachexia syndrome (*Maranamadishet*). Cachexia is seen in conditions such as chronic obstructive pulmonary disease (COPD) (*Kaphenarto Deergham Shwasati*), acquired immunodeficiency syndrome (AIDS), diabetes (*Bahu Mutra*), chronic renal failure (CRF), heart failure etc. Cancer cachexia is associated with high mortality, skeletal muscle loss, loss of body weight, damages organs such as brain, liver, pancreas, gut, heart and bone. Due to active catabolism (*Bahvashee Alpa Mutravit*) in refractory cachexia, patients won't get benefit from any treatment (*Maranamadishet*). Cancer cachexia is often associated with a negative energy balance (*Deergham Cheshtate* and *Alpa Mutravit* despite *Bahvashee*) driven by anorexia (*Alpaashee*) along with increased energy expenditure or abnormal metabolism (*Alpa & Bahu Mutravit*). Cancer-associated gut barrier dysfunction (*Alpa & Bahu Vit*) may cause malabsorption, diarrhea (*Bahu Vit*), and ultimately negative energy balance.⁴⁵ Cachexia is characterized

by eating and losing weight (*Bahvashee*) while starvation is not being able to eat and losing weight (*Alpaashee*). Dyspnoea is a breathing discomfort (increased sense of effort for breathing) (*Deergham Shwasati*) usually seen in patients with advanced lung cancer (*Maranamadishet*). Dyspnoea increases with worsening fatigue (*Deergham Cheshtate*), anxiety, appetite (*Alpaashee*), and well-being in lung cancer patients (*Maranamadishet*).⁴⁶ Cough (*Kapharto*), dyspnoea/shortness of breath (*Deergham Shwasati*), fatigue/higher functional impairment/tiredness/low energy (*Deergham Cheshtate*), diminished appetite (*Alpaashee*), presence of COPD (*Kaphenarto Deergham Shwasati*) etc are seen in advanced lung cancer patients (*Maranamadishet*).⁴⁷ The present verse denotes nutrition and diet-related issues, hypermetabolic states, CACS in patients with advanced lung cancer.

Deerghamuchwasya -- Spandate Bhrusham (Verse 14)

A person having prolonged expiration (*Deerghamuchwasya*) and brief or shallow inspiration (*Hraswam Nishwasya*) with loss of consciousness (*Paritamyati*); a person having shallow respirations (*Hraswam Prashwasati*) with frequent (*Bhrusham*) abnormal movements/tremors (*Vyavidham Spandate*) indicates an imminent death (*Maranamadishet*).⁵ Prolonged exhalation (*Deerghamuchwasya*) is seen in COPD, asthma, cystic fibrosis, bronchiectasis etc characterized by difficulty with exhaling air (*Deerghamuchwasya*).⁴⁸ Exhalation takes longer time (*Deerghamuchwasya*) due to airway obstruction in COPD patients and it is associated with high mortality and morbidity (*Maranamadishet*). Hyperinflation in COPD occurs due to expiratory flow limitation caused by increased airway resistance and reduced lungs' elastic recoil (*Deerghamuchwasya*). Inspiratory muscle fatigue, respiratory alternans, tachypnea, abdominal paradox, increase in PaCO₂, fall in respiratory rate and minute ventilation (*Hraswam Nishwasya*), respiratory acidemia and hypoxemia (cause *Paritamyati*/loss of consciousness) are seen in COPD patients.⁴⁹ Loss of consciousness (*Paritamyati*) could occur due to severe hypoxemia. Headache, breathlessness (*Deergham Shwasati Hraswam Nishwasati*), restlessness (*Vyavidham Spandate Bhrusham*), and tremor (*Spandate Bhrusham*) are the nonspecific symptoms of hypoxemia (*Paritamyati*). Resting hypoxemia (*Paritamyati*) with secondary pulmonary hypertension in COPD patients (*Deergham Shwasati Hraswam Nishwasati*) is associated with worsened survival (*Maranamadishet*).⁵⁰

Delirium due to respiratory dysfunctions (*Hraswam* or *Deerghamuchwasya*) may be associated with hypoxemia, restlessness (*Vyavidham Spandate Bhrusham*), agitation (*Vyavidham Spandate Bhrusham*) and disturbed consciousness (*Paritamyati*).⁵¹ The motor symptoms of PD include tremor (*Vyavidham Spandate Bhrusham*), rigidity, akinesia, bradykinesia, postural instability, and gait disturbances. There is often an increased risk of morbidity and mortality (*Maranamadishet*) due to respiratory dysfunctions in patients with PD. Symptoms associated with pulmonary dysfunction such as dyspnea (*Hraswam* or *Deerghamuchwasya*), exercise intolerance, atelectasis, hypoxia, hypercapnia, acute respiratory failure (*Paritamyati*) etc are seen in patients with PD. The presence of dyspnoea in patients with PD is associated with upper airway obstruction (*Deerghamuchwasya*), restrictive respiratory change (*Hraswam Nishwasati*), autonomic dysfunction and hyperventilation.⁵² The present verse denotes either chronic obstructive lung disease/COPD with cerebral hypoxia and loss of consciousness or respiratory dysfunctions in patients with PD.

Shiro Vikshepate -- Shlatha Sandhana Bandhana (Verse 15)

A person having head tremor/tonic, sustained turning or tilting of head (*Shiro Vikshepate*), bringing the deviated head to normal

position (*Aanchayitva*) with forearm (*Prapanikau*) with great difficulty (*Krichrat*), excessive sweating (*Sruta Sweda*) on forehead (*Lalata*) and flaccid or limp body parts/joints (*Shlatha Sandhana Bandhana*) denotes an imminent death (*Maranamadishet*).⁵ The present verse is taken from *Avaakshiraseeyam* of CIS and it denotes spinal cord injury (SCI) or intramedullary spinal cord tumours.⁵³ *Shiro Vikshepate* denotes dystonic head tremor with cervical dystonia (CD); *Aanchayitva Prapanikau Krichrat* denotes a voluntary manoeuvre or movement that is used to correct the dystonic head posture (Geste Antagoniste / sensory trick); *Lalata Sruta Sweda* denotes focal/craniofacial hyperhidrosis due to dysautonomia; *Shlatha Sandhana Bandhana* denotes postural instability (e.g., spontaneous loss of balance, unprovoked falls, tendency to fall on pull-test), limb apraxia, cerebellar ataxia, gait impairment, paraplegia, quadriplegia, distal muscle atrophy etc pathological conditions. The whole verse represents conditions including cervical dystonia with dysautonomia in various neurodegenerative syndromes, Torticollis with rotatory atlanto-axial dislocation or subluxation and Tauopathies with movement disorders.

Head tremor (*Shiro Vikshepate*) is one of the early presentations of CD. The tonic phenotype of CD is characterized by sustained turning (torticollis), head flexion (anterocollis), extension (retrocollis), lateral tilting (laterocollis), or combinations of these (*Shiro Vikshepate*) with or without head tremor (*Shiro Vikshepate*). Head tremor (*Shiro Vikshepate*) is also seen in cerebellar dysfunction (may represent cerebellar ataxia - *Shlatha Sandhana Bandhana*).⁵⁴ Spinal cord lesions (syringomyelia) and neck trauma can cause cervical dystonia (*Shiro Vikshepate*). Dystonia-Parkinsonism with tyrosine hydroxylase deficiency (DYT/PARK-TH) is characterized by CD (*Shiro Vikshepate*), hypotonia (*Shlatha Sandhana Bandhana*), autonomic disturbances (*Lalata Sruta Sweda*).⁵⁵ Common symptoms of aromatic-L-amino acid deficiency are hypotonia (*Shlatha Sandhana Bandhana*), movement disorders i.e., dystonia (*Shiro Vikshepate*) and autonomic symptoms i.e., hyperhidrosis (*Lalata Sruta Sweda*).⁵⁶ The presentation of atlantoaxial dislocation may range from minor neck pain to death (*Maranamadishet*). Patients may present with neck movement restriction (*Krichrat Aanchayitva*), weakness (*Shlatha Sandhana Bandhana*), pyramidal signs, and rarely quadriplegia (*Shlatha Sandhana Bandhana*).⁵⁷ In severe atlantoaxial dislocation or subluxation, torticollis may be noted with the head tilted toward one side, turned toward the other and in slight flexion (*Shiro Vikshepate*). When an attempt is made to turn the head opposite to the direction it faces (*Aanchayitva*), it is found to be difficult (*Krichrat*).⁵⁸

Facial hyperhidrosis can occur on the entire face but especially on the forehead (due to the highest eccrine sweat glands concentration) (*Lalata Sruta Sweda*) and on the upper lip. It is seen in neurological conditions including PD, spinal cord injury, and stroke.⁵⁹ During autonomic dysreflexia in high lesions sweating occurs on the face (*Lalata Sruta Sweda*) and neck. In chronic tetraplegia (*Shlatha Sandhana Bandhana*), hypertension during autonomic dysreflexia is usually associated with sweating over the face (*Lalata Sruta Sweda*). Weakness, fatigue and tiredness (*Shlatha Sandhana Bandhana*) are the non-specific symptoms of autonomic dysfunction.⁶⁰ The geste antagoniste is also known as sensory trick (*Aanchayitva Prapanikau Krichrat*), is a major and frequent sign in dystonic patients (*Shiro Vikshepate*). Geste antagoniste is a voluntary manoeuvre (*Aanchayitva Prapanikau Krichrat*) that temporarily reduces the severity of dystonic tremors or postures (*Shiro Vikshepate*). This alleviating maneuver (*Aanchayitva Prapanikau Krichrat*) is now considered as part of the diagnostic criteria of organic dystonia (*Shiro Vikshepate*).⁶¹ Tauopathies are a heterogeneous group of neurodegenerative disorders characterized by glial and/or neuronal inclusions of the protein called

'tau'. Tauopathies clinically manifests as movement disorders, MND, and dementia either independently or in varied combinations. Richardson syndrome (RS), PD, corticobasal syndrome, primary gait freezing (PGF), cerebellar syndrome, SCA, HD, DLB, primary lateral sclerosis (PLS), PSP, AD, CBD, MSA etc comes under the category of tauopathies.⁶² The present verse represents CD with geste antagonista, facial hyperhidrosis due to dysautonomia and ataxia or fatigue or posture instability seen altogether in various tauopathies.

Uthapyamana -- Padau Vikaroti Cha (Verse 16)

A person fainting (*Sammuhyet*) in upright posture (*Uthapyamana*), always prefer to stay in supine position (*Swapati*) and having foot cramps (*Padau Vikaroti*) will not survive (*Maranamadishet*).⁵ The present verse is taken from *Pannarupeeyam* chapter of CIS and it denotes central vertigo or orthostatic hypotension or pre-syncope.⁴² The present verse denotes vasovagal or neurocardiogenic syncope. Vasovagal episodes (*Sammuhyet*) occur in a sitting or standing position (*Uthapyamana*) but they never occur in a horizontal or supine position (*Uthana Eva Swapati*). Tonic or opisthotonic or seizure like tonic-clonic movements (*Padau Vikaroti*) may occur during unconsciousness (*Sammuhyet*). Secondary cerebral hypoxia (*Sammuhyet*) and tonic-clonic movements (*Padau Vikaroti*) will occur when the patient is kept in an upright posture (*Uthapyamana*). The patient will be alert and awake shortly after coming in to a supine or horizontal position (*Uthana Eva Swapati*).⁶³ In vasovagal episodes (*Sammuhyet*), blood pressure recovers within 30 seconds of tilt back to the horizontal position (*Uthana Eva Swapati*).⁶⁴ Syncope is characterized by a sudden transient loss of consciousness (*Sammuhyet*) with spontaneous recovery. Syncope (*Sammuhyet*) is associated with high mortality (*Maranamadishet*) and it may be the warning sign (*Arishta Lakshana*) before sudden cardiac death (*Maranamadishet*). Cardiac syncope may be associated with asynchronous myoclonic jerks (*Padau Vikaroti*).⁶⁵ *Uthana Eva Swapati Padau Vikaroti* also denotes conditions such as restless legs syndrome (RLS) or periodic limb movement disorder (PLMD) associated with various fatal conditions.³⁸

Shayanasana -- Ledhi Dashanachadau (Verse 17)

A person, who is trying to grab or touch (*Jigrukshati*) the objects like bed (*Shayana*), chairs (*Asana*), walls (*Kudya*) etc that are not present (*Asadeva*); inappropriate laughing (*Ahasyahasi*) with loss of consciousness (*Sammuhya*) and frequently licking (*Ledhi*) his/her gums (*Dashanachadau*) denotes an imminent death (*Maranamadishet*).⁵ The present verse is taken from *Anu Jyoteeyam* chapter of CIS and it denotes somatosensory or haptic object perception impairments (*Sammuhya*) with delirium.⁶⁶ The level of consciousness may fluctuate ranging from mild drowsiness to semi-comatose (*Sammuhya*) in more advanced cases (*Maranamadishet*) of delirium. Disorientation (*Sammuhya*), perceptual disturbances (*Shayanasana Kudyadau Asadeva Jigrukshati*) such as illusions, misinterpretations, and hallucinations (where no object is actually present) (*Asadeva Jigrukshati*) are seen in delirium patients. Visual hallucinations (*Shayanasana Kudyadau Asadeva Jigrukshati*) are the most common and they may be simple or complex. Inappropriate (*Ahasyahasi*) or disruptive behaviour is also commonly seen in patients with delirium (*Sammuhya*). Dehydration with electrolyte disturbances (cause *Ledhi Dashanachadau*) is one of the common predisposing factors for delirium (*Sammuhya*).⁶⁷ The present verse denotes delirium with high risk of mortality.

Uttarostham Parilihan -- Peeta Arunapi Va (Verse 18)

A person, who licks (*Parilihan*) his/her upper lip (*Uttarostham*) and make abnormal sounds (*Phutkaran Karoti*); perceiving/feeling as

being chased by (*Abhidravati*) blackish/bluish (*Krishna*) or yellowish (*Peeta*) or reddish/reddish-brown (*Aruna*) coloured (*Chaya*) objects/beings denotes an imminent death (*Maranamadishet*).⁵ The present verse is taken from *Chaya Vipratipatti* chapter of *Sushruta Sutra Sthana* and it denotes psychotic disorders associated with movement disorders.³⁸ *Uttarostham Parilihan* and *Phutkaran Karoti* denote oral tics and vocal tics respectively. *Abhidravati Chaya Krishna Peeta Arunapi Va* denotes delusions (paranoid) or visual hallucinations usually seen in psychotic disorders. Abnormal involuntary movements (*Uttarostham Parilihan & Phutkaran Karoti*) are seen in psychotic disorders (*Abhidravati Chaya*) and in movement disorders including Tourette's syndrome (TS) and transient tic disorder. There is a link between psychotic disorders like schizophrenia (*Abhidravati Chaya*) and movement disorders (*Uttarostham Parilihan & Phutkaran Karoti*). TS is characterized by multiple motor tics (*Uttarostham Parilihan*) and vocal tics (*Phutkaran Karoti*). Patients with TS may develop schizophrenia-like symptoms including paranoid ideations (*Abhidravati Chaya*) and feelings of presence or persecution (*Abhidravati Chaya Krishna Peeta Arunapi Va*).³⁸ *Yamabhidravati Chaya Krishna Peeta Arunapi Va* may also denotes blackish/bluish, yellowish and reddish/reddish brown discoloration due to some fatal underlying disease that ultimately leads to *Yama's* (Lord of death) world.

Bhishagbhesaja -- Samavartina (Verse 19)

A person showing anger/hatred/dislike (*Dvisha*) to the physician (*Bhishak*), medicine (*Bheshaja*), food (*Anna*) and drinks (*Paana*), preceptor/spiritual parent (*Guru*) and friends (*Mitra*) should be considered as under the grip of (*Vashaga*) God of death (*Samavartina*).⁵ The present verse is taken from *Anu Jyoteeyam* chapter of CIS and it denotes anger in dying patients.⁶⁶ Anger (*Dvisha*) is a part of the dying process (*Samavartina*) and angry patients usually try to blame others (*Bhishak, Guru & Mitra*) for their disposition. Projection is a coping style characterized by transferring the ownership of one's emotional state (*Dvisha*) to someone else (*Bhishak, Guru & Mitra*). Angry dying patients use projection with success. Various unresolved conflicts in a dying patient (*Samavartina*) may present as inappropriate anger (*Dvisha*) toward the family members, treating physician and staff (*Bhishak, Guru & Mitra*). The second stage of dying process (*Samavartina*) is anger (*Dvisha*) in which the patient expresses anxiety through anger or other emotions (*Dvisha*).⁶⁶ Anger (*Dvisha*) when associated with grief (*Samavartina*) seems to be inappropriate. Anger (*Dvisha*) emerges in a variety of disguises such as disabling illness, chronic unhappiness and maladaptive behaviour (*Samavartina*).⁶⁸

Greeva Lalata -- Sharanam Tasya Devata (Verse 20)

A person having profuse sweating (*Swidyati*) followed by hypothermia (*Sheetalam*) at neck (*Greeva*), forehead (*Lalata*) and chest (*Hrudaya*) with hot or warm (*Ushna*) other body parts (*Apara Pradesha*) will die (*Sharanam Tasya Devata*).⁵ The present verse is the novel contribution by *Vagbhata* and it denotes either Shapiro's syndrome (SS) or SCI. SS is characterized by hypothermia (*Sheetalam*), hyperhidrosis (*Swidyati*) associated with autonomic nervous system dysfunction by hypothalamic dysfunction. Neurodegenerative, genetic, immune and infectious diseases are the main causes of SS.⁶⁹ SS patients may have episodes of hyperhidrosis (*Swidyati*) especially on the face and upper body (*Greeva, Lalata & Hrudaya*) followed by profound hypothermia (32–33 °C) (*Sheetalam*).⁷⁰ Episodes of hyperthermia (*Ushna*) and hypothermia (*Sheetalam*) repeat in patient with SS. Thermal dysregulation (*Sheetalam & Ushna*) could be seen with agenesis of corpus callosum in SS patients. SS and 'reverse SS' are not different entities from each other as episodes of hyperthermia

(*Ushna*) and hypothermia (*Sheetalam*) could be present in the same patient.⁷¹ Hyperthermia is seen in persons with SCI who cannot sweat below the level of injury (*Ushna Aparā Pradesha*); excess sweating (*Swidyati*) above the SCI (*Greeva, Lalata & Hrudaya*) has very limited capacity to dissipate heat. Persons with high thoracic and cervical SCI are susceptible to hyperthermia (*Ushna Aparā Pradesha*) or hypothermia (*Sheetalam Greeva, Lalata & Hrudaya*).⁷² Persons with SCI cannot sweat or dilate below their neurological level of injury (NLI) (cause *Ushna Aparā Pradesha*). The presence of forehead sweating (*Lalata Swidyati*) is seen in patients with incomplete tetraplegia lesions. Thermoregulatory dysfunction (*Ushna & Sheetalam*) after SCI leads to life-threatening consequences (*Sharanam Tasya Devata*) of heat-related illness (HRI). There is a relationship between the NLI and sweating level of injury (SwLOI).⁷³ *Ushna Aparā Pradesha* denotes anhidrosis followed by hyperthermia below the level of SCI and *Swidyati Greeva Lalata Hrudaya & Sheetalam* denotes compensatory focal hyperhidrosis followed by hypothermia above the level of SCI.

Yo Anu Jyoti -- Nopabhunjate (Verse 21)

A person suffering with metabolic slowing/loss of appetite/hypothermia (*Anu Jyoti*), inattention/agitation/restlessness (*Anekagro*), discoloration of the body (*Dushchaya*), and psychosis/depression (*Durmana*) always without any known/visible reason (*Sada*); crows (*Balibhujo Vayasa*) not accepting (*Nopabhunjate*) the *Bali* (a meal/food item) given by a person (*Yo*) indicates an imminent death to that person (*Na Sa Jeevati*).⁵ The present verse is taken from *Anu Jyoteeyam* chapter of CIS and it denotes delirium or behavioural and psychological symptoms of dementia (BPSD) associated with/without bad omens.⁶⁶ Altered mental status is a common condition among older patients in emergency department (ED) (*Na Sa Jeevati*). Various synonyms such as confusion, altered behaviour, not acting right, weakness, agitation (*Anekagro*), lethargy, psychosis (*Durmana*), inappropriate behaviour, disorientation (*Anekagro*), inattention (*Anekagro*), and hallucinations (*Durmana*) are used to denote altered mental status. Acute changes in mental status are secondary to delirium, coma and stupor, precipitated by an underlying life threatening (*Na Sa Jeevati*) medical illness. Vital sign abnormalities such as hypothermia (*Anu Jyoti*) may precipitate delirium. Dehydration and malnutrition (cause *Dushchaya*) are the vulnerability factors for delirium.⁷⁴ Agitation (*Anekagro*), apathy (*Durmana*), aggression, psychosis (*Durmana*), delusions and hallucinations (*Durmana*), wandering (*Anekagro*), hoarding, inappropriate behaviours (*Anekagro & Durmana*) and restlessness (*Anekagro*) are the most common symptoms of BPSD and BPSD is the complication of dementia.⁶⁶ Not accepting (*Nopabhunjate*) the *Bali* offered by a person (*Yo*) to crows (*Vayasa*) denotes bad omen to that offering person and it comes under the domain of *Shakuna Shastra* (knowledge of omens).⁶⁶

Nirnimitam Cha -- Yamakshayam (Verse 22)

All of a sudden, without any known/visible reason (*Nirnimitam*), if a person gets improvement (*Prapnoti*) in intelligence (*Medha*), lustre (*Shobha*), growth/body weight (*Upachaya*) and prosperity/happiness (*Shriyam*) or loses all of these (*Vibhramsham*) denotes an imminent death.⁵ The present verse is taken from *Anu Jyoteeyam* chapter of CIS and it denotes bad fortunes/bad omens.⁶⁶ Dementia is characterized by progressive deterioration of cognitive abilities (*Medha Vibhramsham*) due to ischemic or neurodegenerative pathologies seen in AD, DLB, Vascular and frontotemporal dementia (FTD). Unintentional body weight loss (*Upachaya Vibhramsham*) is a significant feature in patients with dementia and it is associated with higher rates of mortality (*Na Sa Jeevati*), functional status decline, malnutrition

(*Shobha Vibhramsham*) and low quality of life. Depression is one of the non cognitive disturbances of dementia.⁷⁵ Deteriorating financial capabilities (*Shriyam Vibhramsham*) are among the earliest signs of cognitive decline (*Medha Vibhramsham*) and seen in incurable neurodegenerative diseases (*Na Sa Jeevati*).⁷⁶ *Prapnoti Medha, Shobha, Shriyam* and *Upachaya Nirnimitam* may denote positive cognitive, emotional, religious, spiritual and supernatural near death experiences (NDEs). NDEs (*Na Sa Jeevati*) include cognitive experiences such as heightened senses, sudden perception of a specific knowledge, improved consciousness etc (*Medha Prapnoti*) and positive emotional experiences such as immense peace, sudden experience of relaxation, disappearance of pain, heavenly positive feelings etc (*Upachaya, Shriyam & Shobha Prapnoti*).⁷⁷ The present verse denotes either bad omens or neurodegenerative diseases or NDEs.

Gunadoshamayee -- Na Sa Jeevati (Verse 23)

Any deviation (*Anyadhatvam*) from the normal (*Prakriti*) personality/behaviour (*Gunamayee Prakriti Satvadija*) or anatomy/physiology (*Doshamayee Prakriti Vatadija*) either in a healthy (*Swasthasya*) or a person suffering with disease (*Vyadhitasya*) is considered fatal (*Na Sa Jeevati*).⁵ The present verse is taken from *Swabhava Vipratipatti* chapter of *Sushruta Sutra Sthana* and it denotes a wide variety of pathological conditions hyper- and hypopigmentation, hyper- and hypotonia, hyper- and hypothermia, dystrophy, atrophy, hypertrophy, discoloration, ankylosis, sclerosis, dislocations, abnormal involuntary movements, prolapse, '-malacia,' '-megaly,' 'macro- and micro-,' hyperhidrosis & anhidrosis, enophthalmos & exophthalmos, ptosis etc associated with high mortality risk.⁷⁸

Bhakti Sheelam -- Marishyata (Verse 24)

Decline/abnormality (*Nivartate*) of the factors like *Bhakti* (interest), *Sheelam* (personality), *Smriti* (memory), *Tyaga* (giving up/liberal/charitable/donation), *Buddhi* (cognitive functions) and *Balam* (strength) without any known/visible reason (*Ahetukam*) will lead to death (*Marishyata*) within 6 months (*Shadbhirmaasai*).⁵ The present verse is taken from *Anu Jyoteeyam* chapter of CIS and it denotes major neurocognitive disorders.⁶⁶ Disturbances in psychological functioning (*Nivartate Sheelam, Bhakti, Smriti, Buddhi* etc) including decline in cognitive functions (*Nivartate Buddhi*), perception, motor function (*Nivartate Balam*), circadian rhythms, and eating behaviours (*Nivartate Bhakti*) are seen in BPSD. Common symptoms of BPSD include depression & elation (*Nivartate Bhakti*), apathy, delusions, hallucinations (*Nivartate Buddhi*), repetitive purposeless behaviours (*Nivartate Sheelam*), verbal and physical aggression (*Nivartate Sheelam & Bhakti*). Cognitive deficits (*Nivartate Buddhi*) can present as memory loss (*Nivartate Smriti*), agnosia (*Nivartate Buddhi*), apraxia (*Nivartate Balam & Smriti*) and impaired executive function (*Nivartate Balam*) are seen in patients with dementia. More personality changes (*Nivartate Bhakti, Sheelam, Tyaga* etc) are observed in FTD. In advanced dementia cases, the death probability is within 6 months (*Shadbhirmaasai Marishyata*).⁶⁶

Mattavadgati -- Vedanaam (Verse 25)

A person suffering with unstable gait (*Mattavat Gati*), slurred speech (*Mattavat Vaak*), tremors (*Kampa*) and disturbed consciousness or confusion (*Moha*) will die (*Marishyata*) within a month (*Maasaan*).⁵ This part of the verse is taken from *Anu Jyoteeyam* chapter of CIS and it denotes ataxia, delirium, PD, neurodegenerative and demyelinating diseases.⁶⁶ If the person is unable (*Ajaanan*) to feel the pain (*Vedanaam*) when his/her scalp hair (*Kesha*) is plucked (*Lunchana*), it denotes an

imminent death (*Nashyati*) within 6 days (*Shadahaat*).⁵ This second half of the verse is taken from *Avaakshiraseeyam* chapter of CIS and it denotes sensory neuropathy associated with various underlying fatal neurological conditions.⁵³ Sensory/gait/limb ataxia (*Mattavat Gati*), intention tremor (*Kampa*), dysarthria (*Mattavat Vaak*) etc are some of the synonymous terms commonly used to describe Ataxia. Impairment of consciousness (*Moha*) and speech (*Mattavat Vaak*), vertigo (*Moha*), cognitive and behavioural impairment (*Moha*) are some of the symptoms of ataxia. Tremor (*Kampa*), unstable posture and profound gait impairment (*Mattavat Gati*) are seen in PD. The present verse may denote conditions like MSA, PD, MS, PSP, DLB, CBD, SCA, Wernicke-Korsakoff syndrome etc.⁶⁶ Dissociated sensory loss characterized by loss of pain perception (*Ajaanan Vedanaam*) in the cervical region is seen in syringomyelia. Pathology of spinothalamic tract may cause analgesia (*Ajaanan Vedanaam*). *Ajaanan Keshha Lunchanam* denotes various conditions including pure neuritic form leprosy (PNL), silent neuropathy (SN), leprosy neuropathy, diabetic symmetric distal polyneuropathy (DSDP), cryptogenic sensory polyneuropathy (CSPN), Guillain-Barre Syndrome (GBS) etc.⁵³

Na Yati Yasya -- Pretakrutirudiryate (Verse 26)

Inability to swallow (*Na Yati Kantham*) the food (*Aharam*) in the absence of any local disease (*Kanthamayadrute*) indicates an imminent death (*Na Sa Jeevati*).⁵ This part of the present verse is taken from *Avaakshiraseeyam* chapter of CIS and it denotes dysphagia in neuromuscular diseases (NMDs).⁵³ Dysphagia is characterized by impairment in swallowing (*Na Yati Aharam Kantham*) usually seen in patients with NMDs and it is associated with increased mortality and morbidity (*Na Sa Jeevati*). Inability to swallow efficiently (*Na Yati Kantham Aharam*) may lead to life threatening complications such as malnutrition and dehydration (*Na Sa Jeevati*) seen in patients with NMDs. Dysphagia is seen in Duchenne muscular dystrophy (DMD), Amyotrophic lateral sclerosis (ALS), Myasthenia gravis (MG), Inclusion body myositis (IBM), Spinal muscular atrophy (SMA), Polymyositis, Friedreich's ataxia etc. Oropharyngeal dysphagia (*Na Yati Kantham Aharam*) is characterized by the inability to swallow both the solids and liquids. Inability to hold bolus, residue in the oral cavity, reduced mastication, and delayed swallow reflex (*Na Yati Kantham Aharam*) are seen in ALS patients (*Na Sa Jeevati*).⁵³

If informal caregivers (family members) (*Preshya*) avoids or show hatred (*Prateepataam*) towards the patient and the patient looks like a dead person (*Pretakriti*) should be considered as *Arishta Lakshana*.⁵ This second part of the verse is unique contribution of *Vagbhata* and it's not documented prior to him. *Preshya Prateepataam* denotes anger or frustration (*Prateepataam*) of informal caregivers (relatives/family members/friends/domestic helpers) towards a dying family member/patient (*Pretakriti*). Informal caregivers (*Preshya*) face severe stress and usually suffer with anxiety, fatigue, depression, deterioration in family relationships, social isolation and a decline in physical health (leads to *Prateepataam*) while providing care to a dying family member (*Pretakriti*). Psychological, physical, financial, and social stressors (leads to *Prateepataam*) are frequently seen in family caregivers (*Preshya*) of dying individuals (*Pretakriti*). Level of stress (cause *Prateepataam*) associated with end-of-life care management (*Pretakriti*) varies according to the progression of the illness.⁷⁹ The word *Pretakriti* denotes a dying patient showing features such as severe weakness, multiple organ failure, reduced ability, mobility, oral intake, cognitive function, alertness and communication, increased periods of sleep etc. Hence *Preshya Prateepataam Yanti Pretakriti* denotes caregiver burden/stress in informal caregivers providing end-of-life care management.

Yasya Nidra -- Charanau Bhrisham (Verse 27)

Excessive sleepiness/hypersomnia (*Nidra Bhavennitya*) or complete loss of sleep/insomnia (*Nidra Naivava*) in a person (*Yasya*) denotes an imminent death (*Na Sa Jeevati*).⁵ The present verse is taken from *Chaya Vipratipatti* chapter of *Sushruta Sutra Sthana* and it denotes sleep-wake disturbances (*Nidra Bhavennitya* & *Nidra Naivava*) seen in conditions such as neurological illnesses, cancer, stroke, MS etc. Insomnia (*Nidra Naivava*) is usually associated with excessive daytime sleepiness (EDS) or hypersomnia (*Nidra Bhavennitya*) in various neurological conditions. Sleep disturbance (both insomnia and hypersomnia) (*Nidra Bhavennitya* & *Nidra Naivava*) with cognitive impairment is seen in patients with primary brain tumours and PD (*Na Sa Jeevati*). Non-restorative sleep, excessive sleepiness (*Nidra Na Chidyate*), cognitive decline, difficulty in falling and maintaining sleep (*Nidra Naivava*) etc Circadian rhythm sleep-wake disorders (*Nidra Bhavennitya* & *Nidra Naivava*) are seen in various neurodegenerative conditions such as PD, HD and AD (*Na Sa Jeevati*).³⁸

Vakramaapuryate -- Gamishyata (Verse 27&28)

A person suffering with obstruction and/or overflow of tears onto the face (*Vakramaapuryate Ashrunaam*), excessive sweating (*Swidyati*) of soles of the feet (*Charanau Bhrusham*), and opaque conjunctiva or tear film due to abnormal deposits (*Chakshushcha Akulataam*) will not survive (*Yamarashtram Gamishyata*).⁵ The present verse is taken from *Chaya Vipratipatti* chapter of *Sushruta Sutra Sthana* and it denotes ocular sarcoidosis and neurosarcoidosis.³⁸ *Vakramaapuryate Ashrunaam* represent epiphora, *Swidyati Charanau Bhrusham* denote plantar hyperhidrosis and *Chakshushcha Akulataam* represent tear film disorders or abnormal deposits over the conjunctiva leads to opaque or cloudy looking eyes. Sarcoidosis is a multisystem disorder characterized by an inflammation in some vital organs including the eyes (*Chakshushcha*) and central nervous system (*Swidyati Charanau Bhrusham*). Granulomatous inflammation in ocular sarcoidosis may cause lacrimal obstruction, epiphora (*Vakramaapuryate Ashrunaam*), and abnormal conjunctival deposits (*Chakshushcha Akulataam*).³⁸ Small fiber neuropathy is another manifestation of neurosarcoidosis. Dysautonomia characterized by hyperhidrosis (*Swidyati Charanau Bhrusham*) is also observed in the patients of neurosarcoidosis with small fiber neuropathy.⁸⁰

Yai Pura Ramate -- Na Jeevati (Verse 28)

If a person is unable to experience the pleasure (*Aratistai*) from previously pleasurable activities (*Pura Ramate Bhavai*) it denotes an imminent death (*Na Jeevati*).⁵ The present verse is taken from *Avaakshiraseeyam* chapter of CIS and it denotes anhedonia associated with bad prognosis.⁵³ Anhedonia is characterized by the decrease in the capacity to experience pleasure (*Aratistai*) from previously (*Pura*) pleasurable activities (*Ramate Bhavai*). Anhedonia (*Pura Ramate Bhavai Aratistai*) is seen in major depressive disorder (MDD) and is linked with high risk of mortality and morbidity (*Na Jeevati*). Negative symptoms of schizophrenia are associated with high morbidity (*Na Jeevati*) and they include blunted affect, avolition, and anhedonia (*Pura Ramate Bhavai Aratistai*).⁵³ Psychological symptoms such as anhedonia (*Pura Ramate Bhavai Aratistai*) and hopelessness are the better indicators of depression (*Arati*) in patients with terminal illnesses (*Na Jeevati*).⁸¹

Kathayet Na -- Chikitsitum (Verse 29)

Physician (*Bhishak*) should not disclose (*Na Kathayet*) an imminent painful (*Duhshravam*) death (*Maranam*) to the patient and

his/her family members (*Bandhu Mitranam*) even when asked by them (*Prushtho Api*) and also physician should not make any attempts (*Na Cha Uchchettam*) to treat (*Chikitsitum*) the terminally ill patient or dying patient (*Gataaso*).⁵ The present verse denotes the policy or approach needs to be adopted by the physician for patients who are dying with an advanced life limiting illnesses. Breaking bad news (*Na Kathayet Maranam*) can lead to negative consequences for patients, physicians and families (*Bandhu Mitranam*). Doctors may have fears about delivering death news include being blamed, expressing emotion, evoking a reaction, fear of uncertainty and inconsistency, and personal fear of death and illness. Bad news delivered inadequately or in an insensitive manner can impair patients' and his/her relatives' long-term adjustments to the consequences of that bad news (*Duhshravam Maranam*).⁸² Disclosing bad news may create fear, depression and anger in patient or his/her family members, hence Ayurvedic classical texts have advised not to disclose death news to the patient/family members. This policy might be successful and popular in ancient India according to the medical law, practice, cultural, religious and social circumstances during that time period but this is inappropriate in current era. The physician has a legal and moral obligation to convey to the capable family or patient, with clarity and honesty, the bad prognostic status of the patient with justifications when further aggressive support is non-beneficial (hence *Na Chikitsitum*). Physicians (*Bhishak*) can adopt any of these options among do-not-resuscitate status (DNR) or withdrawal of life support or withholding of life support (*Na Chikitsitum*) while approaching a dying patient (*Gataaso*).⁸³ *Na Kathayet Maranam Prushtho Api* is not a practicable or appropriate policy for current era but the policy of withholding the aggressive treatment in a dying patient is relevant to present times than ever before.

Yamadoota -- Parivarjayet (Verse 30)

Lord Yamas' messengers or ministers (*Yamadoota*) and ghosts/evil spirits/monsters (*Pishachadyai*) constantly move around/serve (*Upasyate*) the dying persons (*Paraasu*). These evil spirits (*Pishachadyai*) nullify (*Ghnanti*) the efficacy of medicines (*Aushadha Veeryani*) and makes the treatment efforts futile (*Tasmat Tam Parivarjayet*). The present verse is taken from *Chaya Vipratipatti* chapter of *Sushruta Sutra Sthana*.³⁸ *Pishachadyai* in the present verse may represent various microbes/microorganisms. The present verse represents opportunistic infections caused by various microbes (*Pishachadyai*) frequently seen in people with terminal illnesses or at the end of life stages (*Paraasu*). A wide variety of bacteria, fungi, viruses, and parasites (*Pishachadyai*) become pathogenic in vulnerable, immunocompromised people or they may represent common pathogens causing unusually severe infections. Infections (*Pishachadyai Upasyate*) are common at end of life (*Paraasu*) and linked with high risk of mortality (*Paraasu*). It has been observed that serious infections leads to a peaceful death by producing sedation (*Paraasu Upasyate*), whereas the antibiotic use (*Ghnanti Aushadha Veeryani*) can prolong the process of dying (*Paraasu*) and exaggerates the suffering (*Tasmat Tam Parivarjayet*). The present verse represents the futility (*Ghnanti Aushadha Veeryani*) of Ayurvedic management in patients with terminally illness or at the end-of-life stages.³⁸

Arishtam Nasti -- Tu Mrutyave (Verse 31-34)

Death (*Maranam*) won't occur (*Naasti*) without the prior manifestation of *Arishta Lakshanas* and the presence of (*Drishtha*) *Arishta Lakshanas* denote an imminent death (*Naasti Jeevitam*). Due to the ignorance or lack of prognostication skill of physician (*Anaipunat*) leads to the misinterpretations such as death occurring without the prior manifestation of *Arishta Lakshanas* (*Arishte Rishtha*

Vignanam) and absence of death even in the presence of *Arishta Lakshanas* (*Na Cha Rishthe Api*) (Verse 31).⁵ The present verse is taken from *Pushpitakam* chapter of CIS and it denotes that there is a strong association between the two variables (*Arishta Lakshanas* and death) (Odds ratio greater than 1).⁸⁴ *Sushruta* accepts the above version of *Charaka (Dhruvam Hi Rishthe)* with one exception that death (*Maranam*) could be prevented/warded off even after the manifestation of *Arishta Lakshanas (Nivaryate)* by the virtuous practices (*Kilamalai*), blessings of holy *Brahmanas* (people involved in spiritual practices), with regular meditation/religious penance (*Tapa*), charitable activities (*Dana*) and by consuming *Rasayana* drugs (nutraceuticals/regenerative/anti-ageing) (Verse 32).⁵ The present verse explains the exceptional conditions, in which death could be prevented even in the presence of *Arishta Lakshanas*.⁸⁵ It is evident that there is a controversy between the two classical Ayurvedic texts i.e., *Charaka Samhita (Arishta Lakshanas* denote an imminent death) and *Sushruta Samhita* (death after the manifestation of *Arishta Lakshanas* could be prevented in some cases) pertaining to the association between *Arishta Lakshanas* and death. *Vagbhata* has solved this controversy by classifying *Arishta Lakshanas* in to two groups (*Dvidha Rishitam*) i.e., *Sthira* (irreversible/consistent) and *Asthira* (reversible/inconsistent). *Sthira Arishta Lakshanas* are irreversible or consistent in nature and they indicate an imminent death whereas *Asthira Arishta Lakshanas* occurs (*Samudbhavet*) due to the excessive (*Bahulyat*) vitiation of *Doshas* and they could come back to normalcy (*Shaamyet*) with medicines/treatment (Verse 33&34). Hence, it is evident that *Shrita Arishta Lakshanas* are strongly associated with death (with Odds ratio greater than 1).

Ayurveda Phalam -- Bhavedbhishak (Verse 35)

Whole benefits of (*Krutnam*) *Ayurveda* could be enjoyed (*Phalam*) only when proper estimation of life span (*Ayurgne*) is done (*Pratishthitam*). Hence physician (*Bhishak*) should always (*Sarvada*) be alert (*Aadruto Bhavet*) in identifying *Arishta Lakshanas* with estimation of survival time or prognostication of life expectancy (*Rishtha Gnanam*).⁵ Estimating prognosis (*Ayurgne*) will improve clinical decision making and patient outcomes (*Krutnam Phalam*). Prognosis (*Ayurgne*) should be considered in clinical decision making and physicians (*Bhishak*) should be trained adequately (*Sarvada Aadruto Bhavet*) in this area. Prognostic estimation (*Ayurgne*) is crucial for financial planning, making arrangements for custodial care etc. *Indriya Sthana* is dedicated for prognostic estimation (*Ayurgne*) is helpful (*Phalam*) to the physician (*Bhishak*) to identify various mortality indicators (*Arishta Lakshanas*) and to calculate survival time (*Ayurgne*). Prognostication skills (*Ayurgne*) makes the physicians (*Bhishak*) adequately guide their patients through the dying process and *Arishta Vignana* helps the physician to achieve this.⁸⁶

Conclusion

Vikruteha Vignaneeyam is the 10th chapter of SSAS and it consists of 35 verses deals with prognostic aspects. *Vridhdha Vagbhata* has compiled various *Arishta Lakshanas* pertaining to abnormal behaviour or psychomotor activity in this chapter. Most of the verses of the current chapter were compiled from various chapters of *Indriya Sthana* of *Charaka Samhita (Varna swareeyam, Indriyaaneekam, Parimarshaneeyam, Panna rupeeyam, Avaak shirasiyam, Anu jyoteeyam and Gomaya choorneeyam* chapters), *Indriya Sthana* of *Bhela Samhita (Gomaya churneeeyam* chapter) and *Sutra Sthana* of *Sushruta Samhita (Panchendriyarth, Swabhava and Chaaya Vipratipatti* chapters). To concise the content, *Vagbhata* has made two verses taken from classical Ayurvedic texts written prior to him into a single verse with slight editions and omissions without altering

or deviating from the main theme of the content. Except verse 13 and 20, original and novel contributions of Vagbhata in this chapter are negligible. Vagbhata has tried to solve the controversy between Charaka Samhita and Sushruta Samhita while defining the association between Arishta Lakshana and death (Verse 31-34). Contents of the Vikruteha Vignaneeyam chapter represent various terminal illnesses or end-of-life stages. Vagbhata has done comprehensive presentation of Arishta Vignana with concise explanations for the benefit of Ayurvedic medical fraternity.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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