Review Article

DOI: 10.21276/APALM.3112

Concepts of Pathology from Ancient India-A Review of Sanskrit Literature

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ABSTRACT

Contribution by ancient physicians from the Indian subcontinent towards the field of pathology has been largely unknown globally. This paper aims at providing a glimpse of the knowledge possessed by the Sanskrit scholars of ancient times (derived from Sanskrit texts written originally between 1500 B.C. and 1500 A.D) regarding the basis of disease and correlating their ideas with our present understanding of the concepts in Pathology. Ayurveda (traditional Indian medicine) was developed in India during the Vedic age (approximately 1500-500 BC). The early ayurvedic practitioners gave due importance to etiopathogenesis of diseases as a separate field called Nidana-shastra. (Nidāna means etiology or cause). Charaka emphasized that illness is caused by imbalance of the three principles (doshas) - vata, pitta and kapha, and that genetic defects are transmitted by either the sperm or the ovum. Sushruta depicted various modes of communicable disease transmission - physical contact, exhaled air, close contact, fomites etc, Madhava classified diseases based on pathogenesis (primary or secondary), etiology (endogenous or exogenous) and prognosis (curable, incurable, mild and acute). Chakrapani propounded that epidemics in a community occur due to deterioration of factors that are common to all who inhabit that community- namely air, water, soil, food, etc. Vagabhatta emphasized the importance of personal hygiene and proper nutrition for good health and elaborated the role of contaminated river water in several diseases. Agada tantra is the science of poisons and their antidotes which was founded by Kashyapa.

Keywords: *Pathology, Ayurveda, Sanskrit, India*

The word Pathology is derived from the Latin word *Pathologia* which means the 'study of disease'. In Greek, Pathos means suffering and logos means study- the 'study of suffering'! Roots of pathology are in common with all other branches of medicine, arising in antiquity when early humans tried to reason out the cause of death and the various physical ailments that afflicted them. Gross features of disease that were directly visible, either in life or after death (during funeral ceremonies), were noticed first [1]. Due to the limited knowledge, their minds could only speculate the role of supernatural beings, change of seasons and other elements of nature as the harbingers of death and disease. The earliest records of disease entities come from the Nile river valley- wherein they described several infections, parasitic infestations, injuries, and tumorous growths in their papyri.

While the contributions by Western physicians have been recorded and eulogized, the Eastern contribution to the study of Pathology has been mainly attributed to the Chinese system of medicine. The contribution by ancient physicians from the Indian subcontinent towards the field of Pathology has so far been largely unnoticed, probably because Sanskrit language (in which majority of the medical texts from Indian subcontinent were written) has never had much appeal in the international medical community. This paper aims at providing a glimpse of the knowledge possessed by the Sanskrit scholars of ancient times regarding the basis of disease and recognizing their contributions to the field of pathology, as well as correlating their ideas with our present understanding of the concepts in Pathology. The information collected here is mainly from the Sanskrit texts written originally between 1500 B.C. and 1500 A.D.

India is an ancient land with a unique culture, religion, philosophy, and tradition that governs the way of life and the living. The chief sources of ancient Indian system of thought and medicine have been the four *Vedas* (word *Veda* means knowledge) [2]. *Ayurveda* (traditional Indian medicine) is the system of medicine developed in India during the Vedic age (approximately 1500-500 BC), which makes it one of the oldest systems of medicine. *Ayurveda*, by definition, implies 'the science of life' (*Ayurveda* is a Sanskrit word derived from two roots: *Ayur*, which means life, and *Veda*, knowledge). In mythological terms, Ayurveda has two origins: one from Dhanvantri who revealed this wisdom to his lineage of pupils- *Atreya, Agnivesha, Sushruta*, etc to lessen human suffering. Another from Brahma who revealed this medical knowledge (Agnivesha treatise) to various deities- first to *Daksha*, then to the *Ashwini* twins, and finally to *Indra* [3]. The early hymns of the Rig Veda mention various herbs, and the beneficial health properties of water, air and vegetables.

The early Ayurvedic practitioners (known as *Vaidyas*) gave due importance to the investigation of etiology, pathogenesis and diagnosis of diseases under a separate section: *Nidana-sthana*. (*Nidāna* is a Sanskrit term which means etiology or cause). To the *Nidana-sthana*, *Charaka* has devoted eight chapters, *Sushruta* sixteen chapters and *Vagabhatta* sixteen chapters. After these three classics, known as the *vraddh-a-trayi* (Great-trio) of the ancients, *Madhava-nidana* (written by Madhava) achieved an outstanding reputation dealing exclusively and exhaustively with the diagnosis of diseases [4].

Atharvaveda and Ayurveda

Ayurveda is a part of the *Atharvaveda Samhita* which is considered one of the oldest sources of traditional Indo-European medicine. This text deals with several topics pertaining to medicine- like *Bhaisajya* (diseases, causes and cures), *Ayushya* (longevity), *Paushtika* (progress and wellbeing), Abhicharika (spiritual progress), among others, and is rightfully considered the forerunner of Ayurveda. It describes human anatomy, causes of various types of diseases, such as fever, leprosy, tuberculosis, diabetes, etc, and suggests the cure for each of them through medicinal plants. The *Ayushya* suktas describes the various types of applications and practices for longevity. The historical roots of the *Charaka Samhita* (internal medicine treatise) and the *Sushruta Samhita* (surgery treatise) are found in the Atharva-Veda. Traditionally there are eight main branches of Ayurveda, namely the Kayachikitsa (internal medicine), Balachikitsa (gynecology and pediatrics), Shalakyachikitsa (otoryngology and ophthalmology), Shalyachikitsa (surgery), Vishachikitsa (toxicology), Grahachikitsa (psychiatry), Rasayana (rejuvenation therapy) and Vajeekarana (aphrodisiac treatment) [5].

Charaka Samhita

Charaka was a court physician (1-2 century AD) whose approach to medicine was relatively modern for the times he lived in. *Charaka Samhita* is divided into eight sections, and one of the sections is *Nidana sthana* which contains 8 chapters on *Nidana*- cause of diseases. *Charaka* emphasized that health and disease are not predetermined, and life may be prolonged by human effort and attention to lifestyle. He stressed that illness is caused by disturbance of the balance among the three principles (*doshas*) in a human body - *vata, pitta* and *kapha*. He believed that disease was caused by natural phenomena, and therefore natural, rather than spiritual means were necessary to enable a cure. He believed that various germs may grow in the body only when they get a congenial environment [6]. He classified disease etiology into two categories- *Niyata Hetu* (inevitable factors that include natural disasters, effects of heavenly bodies,etc) and *Aniyata Hetu* (evitable factors like wars, accidents, pathogens, poor hygiene, etc) [7]. He believed that genetic defects are transmitted by a defect in either the sperm or the ovum.

Sushruta Samhita

Sushruta, a physician and surgeon, (~600 BC), in his *Sushruta Samhita* addressed all aspects of general medicine, with an impressive focus on surgical training and surgical instruments. He has been widely regarded in India as the father of Surgery and the father of Plastic surgery. His text *Sushruta Samhita* describes various surgical procedures such as tooth extraction, prostatectomy, urethral stricture dilatation, rhinoplasty, skin grafting, forceps delivery, hernia surgery, caesarian section, fracture manipulation/ fixation, cataract surgery, etc [8,9]. Of six divisions of *Sushruta Samhita*, the second division has sixteen chapters devoted to Pathology (known as *Nidana shastra*). He classified diseases into three major categories- Adhyatmik (psychosomatic, congenital, hereditary and humoral), Adhibhoutik (physical trauma), and Adhidaivik (forces of nature and supernatural beings). He also depicted different modes of communicable disease transmission -physical contact (*Gātrasansparśāt*), exhaled air (*Niḥśvāsāt*), eating with others in same plate (*Sahabhōjanāta*), sharing a bed (S*ahaśayyāsanāccāpi*), using clothes, garlands, and paste (*Vastamālyānulēpanāt*), etc. Sushruta also propounded the role of male/female factor in gender development during conception. He incriminated transmission of malaria to a biting insect. He conceptualized that sedentary lifestyle could cause obesity, diseases and death and advised moderate exercise in his prescriptions to prevent and treat diseases and to maintain equilibrium among the humors- notably *kapha*. He regarded Diabetes (known as *Prameha*) as a disease of the urinary tract and classified it into two types - Sahaja (hereditary) and Apathyanimittaja (acquired) [10]. He described a condition *Baddha Gudodaram* which closely resembles Hirschsprung disease; and described a surgical technique (similar to sigmoid colostomy) for this condition [11].

Madhava-nidana

Rogavinischaya (word meaning the ascertainment of diseases), traditionally known as Madhavanidana is a comprehensive work compiled by *Madhava* (7^{th}-8^{th} AD), a native of Bengal, and an astute diagnostician of his time. In the 79 chapters of this treatise, he lists diseases along with their causes, symptoms, and complications. By about 850 AD, his works had already been translated into Arabic [12]. According to Madhava, the five elements of diagnosing and treating any disease are: nidana (origin), purvarupa (prodrome), rupa (symptoms), upasava (therapeutic tests leading to diagnosis) and samprapti (Pathogenesis and clinical pathology). His treatise included chapters on the

pathology of a wide variety of symptoms like such as fever, diarrhea, dysentery, nausea, cough, anemia, syncope, jaundice, indigestion, constipation, etc and a variety of diseases like asthma, hemorrhoids, tuberculosis, small pox, measles, epilepsy, gout, gastroduodenal ulcers, etc. His systematic approach included five methods of evaluating a disease - etiology, the prodromal or preclinical stage, main presenting signs and symptoms, complications, and progression of the illness. He emphasized the importance of distinguishing one illness from another, and introduced the concepts of differential diagnosis, symptom clusters and specificity in his treatise. He also devoted an entire chapter to smallpox (masūrikā).

Chakrapani's *Chikitsasamgraha*

Chakrapani Datta was a Bengali Ayurveda practitioner and scholar who lived during the 11th century. Among his most celebrated works are Chikitsasamgraha (collection of medical practices and procedures), Dravyaguna (properties of plants), and Sarvasarsamgraha (collection of the essence of things). He described the causation of disease and epidemics. As per Chakrapani, individuals differ in physical constitution, dietary habits, strength, immunity, etc; and epidemics in a community occur due to vitiation of factors that are common to all those who inhabit that community- namely air, water, soil, food, etc. These factors lead to the simultaneous manifestation of disease having the same set of symptoms among all the inhabitants leading to widespread manifestation in the community [7].

Vagabhatta's *Ashtanga Sangraha*

Vagabhatta lived in Sindh (modern Pakistan) sometime between 4-7 century AD. Several works associated with his name are *Ashtāṅgasaṅgraha* and the *Ashtāngahridayasaṃhitā*. He broke with tradition by questioning the concepts and ideas behind *kapha, pitta* and *vayu*. He emphasized the importance of personal hygiene to good health and elaborated the role of contaminated river water in disease causation. He stressed that the existence of various pathogens can be inferred from the disease manifestations, even though they are totally invisible to the human eye [13].

Kriyakala or Natural history of disease

Kriyakala is one of the age-old principles described in the classical treatises of Ayurveda. It describes different phases of disease and the concept can be compared with natural history of disease in modern medicine. The stages are *Sanchaya* (accumulation), *Prakopa* (vitiation), *Sthanasamsraya* (localization), *Prasara* (dissemination), *Vyakti* (manifestation) *and Bheda* (complication). The classical treatises of Ayurveda describe certain intervention measures for each stage of disease- examples being *dinacharya* (daily health promotional activities), *ritucharya* (season-specific health promotional activities), *aahara* (specific dietary regime), vyayama (exercise), etc. The basic objective is to prevent disease before it develops in order to maintain health [7].

Biology of cancer

Cancer (karkatarbuda), in various ayurvedic treatises, has been described as an abnormal and unexplained growth of cells and tissues. Several terminologies for tumors exist in Ayurveda- Granthi (glandular swelling), Arbuda (fleshy outgrowth), karkatarbuda (a malignant tumor), Dwirabuda (tumor metastasis), adhyarbuda (tumor recurrence), Vranarbuda (ulcerative or suppurative tumor). Sushruta described cancers as gradually increasing, globular, slightly painful, fixed, deep-seated, fleshy masses that can arise from any part of the body [14]**.** The concept of Shatkriyakala describes the six stages of development of cancer- Sanchaya (stage of accumulation), Prakopa (stage of vitiation), Prasara (stage of dissemination), Sthanasamsraya (stage of localization away from primary site), Vyakti (stage of manifestation) and Bedha (stage of complication) [15]. This Shatkriyakala model of tumorigenesis and dissemination preceded the modern concepts of cancer biology by almost 2000 years. While describing the treatment of tumors, Sushruta emphasized upon the complete removal of tumors, as incomplete removal causes recurrence and ultimately kills the person- just as a small spark of fire can destroy an entire house.

Nutritional Deficiencies

Keeping the vata, pitta, kapha, mamsu, meda, asthi, majja and shukra in balance was considered vital for maintaining a good health. Ayurveda recognizes nutritional deficiencies as an important cause for certain ailments. Diseases due to excessive nutrient intake were known as santarpana janya (obesity, diabetes mellitus, cardiac disorders, infertility) and diseases due to inadequate nutrient intake were known as aptarpana janya (anorexia, anemia,)- the best example being *Panduroga* (anemia) for which deficiency of Lohatatwa (Iron) was considered responsible; cooking in iron pots is still practiced in parts of India to prevent anemia. In the same context, in cases of protein deficiency in diseases like rajayakshma (tuberculosis), it was advised to partake meat. Severely stunted growth in children or inability of a child to walk after 1 year of age was known as Phakka roga (rickets) [16]. Chakrapani advocated the use of cowrie shell powder for fracture healing and pearl oyster powder for wound healing. Certain foods were considered healthy (hitahara) and certain others unhealthy (ahitahara). Immunity is known as 'ojas' in Sanskrit. Immune disorders have been described in Charakasamhita.

Forensic sciences

Kautilya's *Arthashastra* states that death can be caused by four ways of stopping the breathing (strangling, hanging, asphyxiation or drowning), two ways of physical injury (by beating or by throwing from a height), or poisoning (by poisons, snake or insect bite, or narcotic drugs [17]. This treatise also describes the necessity of autopsy in establishing the cause of death. It states that the magistrate shall conduct a postmortem on any case of sudden (unnatural) death after smearing the body with oil in order to accentuate bruises, swellings and other injuries. Ashumrita parikshagara (examination of men who recently died) to ascertain cause of death was promoted to determine any *Sadyomaranalingani* (signs of recent death) and *Asadhyavishapitalakshanani* (signs of incurable patient of poisoning). These reports of inquest were also necessary in higher courts of law (Kontaka Sodhana) during the reign of the emperor Chandragupta. The dead bodies in cases of homicide, suicide or those who died of accidents, were kept in an examination room, which was set apart for the purpose and the cause of death had to be reported after post-mortem examination to higher authorities. To prevent decomposition, dead bodies were preserved by immersion in oil [18]. Both Arthashastra and Atharvaveda state that cases of suicide by hanging should be investigated to rule out any foul play. Atharvaveda also necessitates examining the personal belongings (clothes, dress, and ornaments) of any unknown dead body in order to ascertain the identification and the cause of death.

Toxicology

Visha chikitsa or *Agada tantra* (branch of Ashtang Ayurveda) is the science of poisons and toxins and was founded by Kashyapa. It deals with various methods of eliminating the poisons out of the body and recommends specific antidotes for various types of poisons [19]. The students of the Kashyapa School of toxicology- *Vishavaidyas* (poison doctors) were employed by various kings to protect the members of the royal families from being poisoned, and to administer poison to the king's enemies. Two types of poisons that have been described in the Agada tantra- the natural and artificial. The natural poisons are classified as inanimate (Sthaavara) and animate (Jangama). Inanimate poisons (*Sthaavara*) have origin from plant matter, elements or mineral ores. Animate poisons (Jangama) are venom of snakes, scorpions, worms, insects etc. Artificial poisons (*Gara* or *Kritrima Visha*) are the invented poisons which are prepared by combining different kinds of animate and inanimate poisons [20].

Funding

None

Competing Interests

None

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Financial or other Competing Interests: None.

Date of Submission : 15/08/2021
Date of Final Revision : 23/11/2021
Date of Acceptance : 04/12/2021
Date of Publication : 30/12/2021