

FUTURE PROSPECTS OF AYURVEDA: UNVEILING THE PRESENT AND EXPLORING NEW HORIZONS

Abstract

Ayurveda, the traditional system of Indian medicine is geared up to take its place as the mainstream of healthcare and witnessing a renaissance. During the post covid time's awareness of good life style, food habits have emerged as essential factors for maintenance of health. In addition, due to the changing work patterns, life styles, shrinking world and sedentary habits are leading to many metabolic disorders. In this context, Ayurveda has much to offer. There are many unexplored aspects in Ayurveda which may offer new leads for futuristic medicine, be it new route for administration of medicines or new drug discovery or as a ready reckoner to brace the challenges of aging process. The concepts mentioned in Ayurveda have paved the way for research in interdisciplinary sciences and stood the test of time. For instance, Dinacharya (Daily regimen) is the need of the hour for disease control and prevention at the community level for improving the public health. The research involving interdisciplinary sciences have ushered new era of Ayurgenomics, Systems biology, Bioinformatics and many other new branches. This chapter intends to cover the less explored areas of Ayurveda which may lead to new horizons, new avenues to tackle issues which may emerge in future healthcare.

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I. INTRODUCTION

Ayurveda, also called as “Biological science” is a traditional system of therapeutic medicine which has its origin from ancient times in India. It has survived and actively flourished from various ages till now. Rooted in the profound understanding of the interconnectedness between the mind, body, and spirit, Ayurveda offers a comprehensive approach to health and well-being, emphasizing balance, harmony, and the promotion of a vibrant life.

Ayurveda, the ancient Indian traditional system of medicine, has stood the test of time for thousands of years, providing holistic approaches to healing and promoting well-being. As we step into the future, the world of Ayurveda is undergoing an intriguing transformation, blending its timeless principles with cutting-edge technology and scientific advancements. This convergence of tradition and innovation paves the way for exciting possibilities and opens new avenues for the practice and understanding of Ayurveda.

In recent years, Ayurveda has experienced a global resurgence, with individuals seeking alternative healthcare solutions. This renewed interest has sparked a wave of research and experimentation, driving the evolution of Ayurvedic practices into the realm of modern healthcare. There are many avenues yet to be explored by the torch bearers of the system like researchers, practitioners and experts in this field who are involved to take the responsibility of keeping in system agile and immensely contributing towards the growth for the future endeavor. As we embark on this journey, we delve into the futuristic trends in Ayurveda that are reshaping the way we approach health, wellness and longevity. The healthcare system around the world faced a unique challenge by the pandemic Covid 19. It has brought major awareness on the health and made it focus more on human life and lifestyle with good diet and led to a paradigm shift in the healthcare industry with its focus approach from illness to wellness. For instance, Indian granny’s recipe kadha which was given least importance and vehemently avoided earlier suddenly found an upgraded status. As a result, Kadha or Kashaya was voted as the ‘The Drink of 2020’ [Shubhashree et al., 2023]. Ayurveda practitioners have contributed significantly during the times of Covid in reaching out to the grassroot levels. Ayurveda interventions like Ashwagandha (*Withania somnifera*) and Shunti (*Zingiber officinale*) have shown promising results in reducing the duration of clinical recovery, improving the time to obtain viral clearance thereby aiding the natural healing process of the body [Singh et al., 2023].

The World Health Organization (WHO) now refers to Ayurveda, Yoga and other traditional systems of medicine as Traditional, Complementary and Integrative Medicine (TCIM) WHO [WHO, 2019]. The term “AYUSH” refers to Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy systems of medicines.

II. AYURVEDA AND SWASTHYA

Ayurveda has been advocating the principle “Swasthya” rather than absence of illness, though modern medicine understands health as the “absence of disease” the World Health Organization (WHO) uses a more holistic view of health; “state of complete physical, mental and social well-being and not merely absence of disease or infirmity [Basisht 2014].

The concept of “Swasthya” or wholeness, in other words, optimal health and well-being are based on inner wholeness together with a balance of mind, body, social environment and physical environments. The approach to health care in the future has undergone a paradigm shift from standardized prevention and treatment to personalized prevention and treatment, from short-term to long-term sustainable intervention, from single molecular targets to an integrated system of networks, and from treatment with side effects to prevention and comprehensive health promotion [Seetharaman et al., 2021]. The objectives of Ayurveda are to maintenance of health of the healthy person and to treat the disease. Ayurveda generally provides advice on how to prevent illness, promote health, and maintain it through dietary changes, lifestyle modifications, and other interventions. Ayurvedic therapies, which include herbal/herbo mineral medications and detoxification techniques, play a vital role in restoring the health of ailing people [Dua, et al., 2023].

To maintain “Swasthya” daily regimen, seasonal regimen and a proper diet should be followed. Ayurveda has described various rules and regimens, regarding diet and behavior to get acclimatized to seasonal changes easily. The primary concept of the Ayurvedic medical philosophy is prevention [Thakkar et al., 2011]. Many of these preventive concepts have amassed sufficient scientific data to persuade the proposal that they can be implemented across cultures around the world.

III. AYURVEDA AND EPIGENETICS

The emerging field of epigenetics is bringing attention towards Ayurveda. Epigenetics can control the expression of genes. In other words, it has shown that changes in diet and life style and stress management have an impact in the struggle to fight against genetic disorders and genes are not the only ones who decide the destiny. A comparison has been given to the software of a computer which decides the programme. Just as Ayurveda suggests, one's psychological state and physical environment affect or sustain gene expression levels and patterns. In contrast, an unhealthy lifestyle may "turn on" the harmful genes via an epigenetic process, leading to an increase in the production of pro-inflammatory cytokines or other disease-causing proteins [Basisht, 2014].

The primary causes of epigenetic alterations are Lifestyle and behavior, diet and digestion, stress, and environmental variables. Ayurveda addresses these variables, which influence the Deha (body) Prakriti (psychophysiological constitution), which corresponds to the phenotypes, and the Janma (birth) Prakriti (genotype) indirectly. Thus, epigenetics is seen as a crucial Ayurvedic mechanism. This linkage, insight, and comprehension have resulted in improved communication and comprehension with the allopathic medical system, as well as a greater integration of both sciences in the management of optimal health. Furthermore, research into Ayurvedic modalities that alter gene expression would improve the linkage and comprehension between the existing medical system and Ayurveda [Sharma and Wallace, 2020].

The "P4" approach is a new approach in medicine to reduce the burden of chronic diseases that implies predictive, preventive, personalized, and participatory approaches that have great potential to address the underlying mechanisms of chronic diseases by harnessing technology and an increasingly better understanding of environment-biology interactions, evidence-based interventions, and so on [Sagner et al., 2017].

Renowned Biomedical Scientist Bhushan patwardhan also advocates that Ayurvedic researchers should develop strategic collaborations with innovative initiatives involving predictive preventive personalized medicine (PPPM). This path leads to exploration of the concept of “Prakruti” as Prakriti-based medicine is speculated to change the scenario of global health wisdom. Ayurvedic treatment modalities are based on ahara (diet), vihara (lifestyle), and aushadhi (medication), which are the three pillars of prakriti-based medicine making it a holistic science [Chatterjee and Pancholi, 2011].

IV. PRAKRITI, AYURGENOMICS AND AYURNUTRIGENOMICS

Ayurveda classifies the human population as Vata, Pitta and Kapha types based on three major constituents or Prakriti. Prakriti is a manual or guide to personalize the medicine and diet. In Ayurveda, the central concept of health and disease is based on an individual's uniqueness. [Patwardhan B, et al 2006] Ayurvedic Prakriti assessment is based on distinctions in physical, physiological, and psychological traits and is not influenced by racial, ethnic, or geographical factors [Ghodke Y, et al. 2011]. It is speculated that different prakriti's have unique metabolic activities. Kapha is slow, Pitta is fast, while Vata is considered to have variable metabolism. The discovery of genetic variants driving Prakriti's metabolic variability has opened up new paths and approaches to Pharmacogenomics.

Different prakriti may have different drug metabolism rates associated with drug metabolizing enzyme (DME) polymorphism as well. In a study by Y.Ghodke and SharmaVikas, a remarkable association between CYP2C19 genotypes and Prakriti with fast and slow metabolism as main distinguishing and differentiating traits was identified. Ayurgenomics: A CSIR study establishes links between Ayurveda and Modern Science for Predictive and Personalized Medicine.

Ayurgenomics presents a personalized approach in the predictive, preventive, and curative aspects of stratified medicine with molecular variability, which includes the study of inter individual variability due to genetic variability in humans for assessing susceptibility, and establishing diagnosis and prognosis, mainly on the basis of the constitution type of a person's Prakriti.

Ayurnutrigenomics is an emerging field of interest in which the selection of a suitable dietary, therapeutic, and lifestyle regime is made on the basis of clinical assessment of an individual maintaining one's Prakriti. This concept of personalized nutrition is a new concept of nutrigenomic research for generating individualized functional foods and nutraceuticals suitable for one's genetic makeup with the help of Ayurveda. [Banerjee S, et al ,2015].

Ayurveda combines foods (Pathyaahara or Ahara) and drugs (Aushadha) under the umbrella of therapeutics, to maintain harmonization of the Doshas or physiological factors with respect to Prakriti and other environmental factors [Debnath PK, et al.,2010]

Research on nutrition based on Prakriti is emerging as a major field, be termed as Ayurnutrigenomics, which presents a huge scope of development toward the understanding of nutrigenomics and molecular nutrition research. It helps in structuring health recommendations and personalized food design. This novel concept of Ayurnutrigenomics is an emerging area of research, which may unfold future possibilities towards safe therapeutics

in future [Banerjee S, et al.2015]. Prakriti-based medicine has the potential to offer remedies to the challenging health issues like adverse drug reactions, drug withdrawals etc.

Fields of genomics, proteomics, metabolomics, and now epigenomics ('omics' technology of system biology) study the contribution of genes, proteins, metabolic pathways and non-genetic factors to human physiology and variations in pathways that has vital role in disease susceptibility of an individual. Ayurgenomic is expected to provide explanation regarding the effective administration of current drugs by targeting them on patients of particular Prakriti. It offers a new bridge between traditional medicine and modern medicine by providing a rigorous scientific understanding of basic concepts, and at the same time incorporating the practical preventative approaches of Ayurveda into modern medicine.

V. GUT MICROBIOME AND AGNI

Ayurveda has described Agni as an important factor of digestion and metabolism in our body. Ayurveda has given utmost priority to the "Gut health" linking it to the health of an individual. Diet and digestion influence the composition of the gut microbiome. Ayurveda, is perhaps the oldest science which has been focusing on the role of digestion in health and disease for centuries. Wallace, R has presented the connection between the gut microbiome and various prevention and therapeutic approaches of Ayurveda [Wallace, 2020].

Gut microbiota is an organ by itself, with an extensive metabolic capability and functional plasticity [Jandhyala et al., 2015]. In a healthy human, the gut microbiota has a symbiotic interaction with the gut mucosa and is associated with metabolic, immunological, and gut protective activities [Shi N et al., 2017]. The gut microbiota takes nutrients from the host's diet and sheds epithelial cells. [Ramakrishna BS and others] According to emerging data, dietary components can have a direct impact on the composition and metabolic activity of the mammalian gut microbiota, affecting both physical and mental health. Anthocyanins, in particular, increase gut microbial health, reduce inflammation, and reduce the risk of colorectal cancer [Shondelmyer et al., 2018].

A study of the relationship between prakriti--the foundation of customized medicine in Ayurveda and gut microbiota, a potential indicator of an individual's health would substantially increase precision therapy. Exercise and a high-fiber diet, including fruits, vegetables, legumes, and whole-wheat grain products, have also been proven to boost microbial diversity [Clarke et al.2014;Flint et al, 2012].

Interestingly, the key elements that can impact and induce changes in an individual's three doshas, including age, diet, lifestyle, stress, and environment, are also known to affect the microbiome composition and function [Lakhotia, 2014]. This reveals a probable link between prakriti constitution and microbiome assemblage, as well as how modest physiological or lifestyle changes can lead to disequilibrium and sickness in otherwise healthy people. The study discovered that the overall species diversity increased with age in people for both the gut and mouth microbiome.

It is worthwhile to recollect that Indian thali, delivers both fiber and other phytochemicals by integrating a variety of plant meals in various colors. Thus, variety aids in

the restoration of gut bacterial diversity and has the potential to prevent or treat chronic diseases such as colon cancer and type 2 diabetes [Shondelmyer et al., 2018].

VI. MILLETS

Ayurvedic treatises mention millets under the umbrella of Trinadhanya and Kshudradhanya. Millets have emerged as an excellent choice of nutritious replacement for refined cereals to fight obesity caused by our sophisticated sedentary lifestyle. One of the dietary modifications to tackle obesity is including millet in the diet [Vasavi, 2023]. The high mineral content, antioxidants, protein and lower fat content as compared to rice and wheat makes it a potential therapeutic food. Year 2023 has been declared by the United Nations General Assembly as the International Year of the Millet at the behest of Indian government.

VII. PANCHAKARMA

Panchakarma treatment is a program for the body, mind and consciousness that cleanses and rejuvenates. Panchakarma therapies go a long way in maintaining health. Ayurveda employs the “Panchakarma” method in its therapies. Panchakarma therapy applies various processes for the rejuvenation of the body, cleansing and enhancing longevity. They are Vamana (emesis) Virechana (Purgation) Basti (enema) Anuvasana Basti (Medicated oil enema) and Niruha Basti (Herbal decoction enema) . Shirodhara is a traditional and well-established Ayurvedic therapy that involves slowly and consistently dripping therapeutic oil over the patient's center of the forehead as the patient rests quietly on a comfortable bed. Other liquids, such as coconut water, buttermilk, milk, and so on, are often used depending on the patient's unique needs. Studies have indicated that therapies such as Shirodhara have psycho – neuro- immunological effects such as a drop in noradrenaline levels, a sympatholytic impact, activation of peripheral skin circulation, and an increase in the level of natural killer cells. According to [Xu et al.2008], the mechanism in their study indicates the physiological action of Shirodhara by dripping sesame oil on the forehead may trigger somato-autonomic reflex through temperature sensors or pressure sensors in the skin or hair follicles via the trigeminal cranial nerve. This procedure produced a relaxed state that results in the maintenance of psycho – physiological balance. Shirodhara has shown significant improvement in serum biomarkers of stress, which were reduced after Shirodhara in a study by [Rajan S, et al. 2021].

Yet another study at National Institute of Mental Health and Neurosciences (NIMHANS), Shirodhara coupled with (Brain tonics) Medhya rasayana has been reported in patients of cerebellar ataxia with clinical improvement [Sriranjini et al., 2009].

Abhyanga (oil massage) is the therapeutic intervention of Panchakarma in which the body is treated with simple or medicated oil (full body or on particular body part) according to the need. Abhyanga is promising in reducing subjective stress experience. It has displayed beneficial activity in lowering Heart Rate in all and Blood Pressure in pre hypertensive subjects [Basler, 2011].

VIII. MARMA CHIKITSA

Marma Chikitsa is an advanced technique of Ayurveda related to diagnosis, treatment of particular disease and reducing pain. [Yadav et al.,2022]. The ancient Ayurvedic literature classified 107 vital parts of the body as a seat of prana (life force), and collectively referred to them as Marma.

In present scenario Marma Chikitsa is quite popular in various parts of India due to its quick, permanent, natural, and noninvasive method of therapy. It has developed as new aspects in Ayurvedic non-pharmacological treatment. Marma Chikitsa, when correctly stimulated, aids in the maintenance of the body's vitality and the treatment of disease/pain through natural healing agents such as prostaglandin [Yadav et al., 2022].

Marma therapy's goal is to provide instant pain relief. Marma stimulation can provide analgesia by secreting a variety of prostaglandin inhibitors, endorphins, interferon, and other opioid-like chemicals that are 100 times more effective than opium. Marma Chikitsa can help with traumatic neurological or neurosurgical lesions, paraplegia, hemiplegia, monoplegia, intervertebral disc disorders, and other conditions. It can assist to relieve pain in the nerves, muscles, ligaments, bones, and joints. It can also help improve the function of body organs and achieve equilibrium. Marma Chikitsa is a neuro-endocrine system practitioner. Actually, when pressure or stimulation is applied to certain areas, specific chemical substances and neurotransmitters such as endorphins and enkephalin are released, which convey nerve impulses to the brain, resulting in the desired effect. Another theory states, that the very minor electrical changes that occur at Marma points are capable of producing effect or responsible for triggering the desired effect (Peeyush Trivedi 2022).

IX. HEALTH TOURISM

It is pertinent to mention that national as well as international acceptance of Ayurvedic healing has undoubtedly expanded the boundaries and prospects of Ayurveda tourism. Ayurvedic treatments and rejuvenation therapies are becoming increasingly popular in wellness tourism. India is an important hub for Ayurvedic tourism as it involves low medical cost in comparison to other countries.

The amount of tourists flocking to Ayurveda is expanding at a rate of roughly 20-25 percent per year. The Indian Ayurvedic market is worth Rs 50 billion and is growing at a rate of 10-15% per year, with the similar rate of growth expected for the next ten years [Muralidhar and Karthikeyan, 2016]. Ayush Wellness Centres under the National Ayush Mission has received a budget of Rs. 3,400 crore (US\$ 464.68 million) for the next five years towards the development.

High-quality health-care service delivery in conventional as well as Ayush systems, low cost, and proximity to some potential countries have made India one of the most popular destinations for medical value travel. Publication of an Indian standard IS 17942: 2022 – "Tourism and Related Services – Medical Tourism – Service Requirements" as a modified adoption of ISO 22525: 2020 with inclusion of Ayush-related provisions is also poised to boost the medical value travel related to Ayush sector.

The Indian government recognizes the potential of Ayurveda in health tourism and has been taking steps to promote it. The future scope of health tourism in Ayurveda is promising and has the potential for significant growth. It is important to maintain high quality standards, conduct research to validate treatment efficacy, ensure proper regulation, and promote authentic practices to build trust and credibility in the industry.

A further significant development in the Indian Ayurveda business is the increased use of digital platforms for marketing and distribution, as well as Ayurveda-based digital health platforms. Online platforms have assisted in leveraging digital media to reach a larger audience. The advent of new Ayurveda-inspired brands has resulted in the evolution of breakthrough technology to offer tailored Ayurvedic treatments and products, as well as the launch of their own digital health platforms to give consumers with online consultations, personalized treatments, and wellness [<https://www.indiaretailing.com/2023/05/27/ayurveda-market-in-indiatrends-and-growth-outlook/>].

India is the second largest exporter of AYUSH (Ayurveda, Yoga, Unani, Siddha and Homeopathy) drugs as per Pharmaceutical Export Promotion Council of India (Pharmaexil). There is a global renaissance in traditional and alternative health care systems, resulting in a global herbal commerce worth US\$ 120 billion, which is anticipated to grow to US\$ 7 trillion by 2050 [Ganeshan et al 2016].

X. DRUG DISCOVERY AND NEW FORMS OF DRUG DELIVERY

Several medications have been produced and practiced as 'tradition to trend' from Ayurveda to current therapy. For better therapeutic leads, the potential of Ayurvedic medicine should be investigated further using modern scientific validation methodologies. Several lead compounds have been created from Ayurvedic plants that have a variety of notable medicinal properties [Mukherjee et al., 2017].

In a comprehensive review and meta-analysis of Ayurvedic-based herbal remedies for hypercholesterolemia by [Gyawali et al., 2021] three Ayurvedic herbs-garlic, guggul, and black cumin-were identified as safe and beneficial in lowering cholesterol biomarkers. In addition to drug discovery using Ayurvedic medicine, novel techniques of medication delivery can be investigated. For example, a drug delivered through the nasal mucus membrane has a systemic effect, and one notable research demonstrated that using Devadali juice (*Luffa echinata*) as Nasya (Ayurvedic treatment in which medicine is infused through nostrils) resulted in a significant reduction in the elevated serum bilirubin level in the case of viral hepatitis [K Nishteswar, 2015].

Fumigation therapy is one of numerous Ayurvedic therapeutic modalities in which patients breathe fumes produced by specific formulations. This medicinal technique provides interesting study potential from a phytochemical and ethno pharmacological standpoint, but it goes unnoticed. Fumigation is recommended by Ayurveda as a sterilizing and curative process for a variety of human ailments, including microbiological infections and psychiatric disorders [Vishnu Prasad et al., 2013]. Dhupana is treated with bacteriostatic medications such as Guggulu (*Commiphora mukul*), Vacha (*Acorus calamus*), Haridra (*Curcuma longa*), and others. It reveals that Ayurveda was presumably aware of the role of microorganisms and knowledge of epidemics [Shubhashree et al 2020].

XI. VRUKSHAYURVEDA

Cultivation of medicinal plants has become an urgent necessity in order to meet the growing demand for herbal drugs in the field of medicine [Shubhashree et al., 2018]. The ancient Indian science of plant life known as Vrukshayurveda works with a variety of tree and plant species and promotes healthy growth and productivity. To ensure quality of medicinal plants, in futuristic context, Vrukshayurveda is quintessential. Chemical fertilizers and pesticide are petroleum derivatives. The world's oil reserves will run out within the next 20 to 25 years, making this agricultural system unsustainable. Alternate cultivation methods are to be developed and Vrukshayurveda is a best option for future.

Vrukshayurveda emphasizes the identification, cultivation, and research of medicinal plants. With the advancement of technology, such as genetic engineering and biotechnology, Vrukshayurveda can contribute to the development of new plant-based medicines and therapies. It can help identify specific compounds and their therapeutic properties, leading to the discovery of novel remedies for various ailments [Meshram and Meshram, 2019].

As concerns about environmental sustainability grow, Vrukshayurveda can promote organic and sustainable farming practices. It can provide guidance on natural fertilizers, pest control methods, and optimal cultivation techniques, reducing the dependence on harmful chemicals and promoting eco-friendly agriculture. Panchagavyam, kunapajala (natural organic liquid manure made from animal and plant products), and other techniques can be investigated further for efficacy and, if proven to be suitable, can be used for the various processes required in developing an organic nursery protocol for medicinal plants [Shubhashree et al., 2018]. This approach aligns with the increasing global demand for natural and environmentally friendly solutions. Health hazards caused by rampant use of chemical fertilizers and pesticides can be cut down. Health hazards in human beings like Digestive ailments, Cancer, Physical and Mental ailments, Reproductive abnormalities, Immune suppression, Hormone disruption etc are due to the haphazard use of chemical fertilizers and pesticides, so if these methods are incorporated as mentioned in Vrukshayurveda (Bio fertilizers, various cultivation techniques, Pest control like fumigation with Sarshapa-Brassica juncea, Hingu – Ferula asafoetida) in agriculture the incidence of deadly diseases in future can be reduced [Ashwini et al., 2022].

Phytochemistry and Pharmacology in Vrukshayurveda can contribute to the exploration of plant-based compounds and their interactions with the human body. By conducting in-depth phytochemical and pharmacological studies, it can provide a scientific basis for the efficacy and safety of Ayurvedic medicines. By studying the individual characteristics and genetic makeup of patients, it can help identify the most suitable medicinal plants and formulations for their specific health conditions. This research can lead to the development of standardized plant extracts, ensuring consistent quality and potency in Ayurvedic formulations. Vrukshayurveda and modern biotechnology can be amalgamated for the benefit of society in future. Vrukshayurveda can help Ayurveda evolve into a more robust and effective healthcare system in the future.

Hence, there is great scope to integrate traditional approaches for increased production of high-quality planting materials. Ayurvedic literatures acknowledged the

relevance of multidisciplinary approaches and emphasized the integration of multiple domains as a viable tool for medical science progress.

XII. PASHU AYURVEDA (VETERINARY SCIENCE)

Central Council for Research in Ayurvedic Sciences (CCRAS), under Ministry of Ayush, Government of India, has actively undertaken numerous endeavors to establish veterinary Ayurveda as an evidence-based science. In this regard, “The Ayurvedic Formulary of India, Part-IV (Veterinary)” was published by the Ministry of Ayush in October 2022, comprising 50 selected formulations to facilitate the manufacture and use of Ayurveda Veterinary Drugs. The ministry has taken steps to explore and revive local health traditions in veterinary Ayurveda. CCRAS is in collaboration with different Veterinary Universities regarding the uses of medicinal plants in veterinary practices. Trans-Disciplinary University (TDU), Bengaluru, is working on developing practical and farmer-friendly ethno veterinary practices. The National Dairy Development Boards (NDDB) is promoting these practices throughout the country in regional languages. Undoubtedly, these initiatives will open new avenues to the practitioners, manufacturers, researchers, academicians, and enthusiasts in the field of veterinary Ayurveda in future [Acharya, 2023].

XIII. NANO MEDICINE

“Rasashastra,” is an integral part of Ayurveda, which deals with medications of mineral origin and comprehensively covers their variety, features, processing procedures, qualities, therapeutic purposes, and management of adverse effects. Metal-based remedies, known as bhasmas in Ayurveda, are used to treat a variety of ailments. Bhasmas are a type of Ayurvedic metallic/mineral preparation that is combined with herbal juice or decoction. A Bhasma is an incinerator ash; the beginning material goes through an elaborate purification process, which is followed by the reaction phase, which involves the incorporation of various minerals and/or herbal extract. Particle size (1-2) is greatly reduced, facilitating medication absorption and assimilation into the human system [Pal et al., 2014]. The end product would be a nontoxic material. Examples are SwarnaBhasma, ShankhaBhasma, TamraBhasma etc. Gold in tradition Indian Ayurvedic medicine as SwarnaBhasma (gold ash) has been characterized as globular particles of gold (56-57 nm). Gold nanoparticles have been detected in Swarnabhasma and the formulation was found effective as antiarthritic agent in rats [Christopher Brown et al 2007]. Bhasma-inspired new drug discovery approach could emerge in future where in several metals based nanomedicines could be developed [Rinku D. Umrani and Kishore M. Paknikar 2015].

Bhavana is a unique traditional method of transformation of raw material/substances into pharmaceuticals through levigation or wet grinding of powdered drugs with juice/decoction/solution of plant, animal, or mineral origin. This approach provides the unique power of influencing a drug's physicochemical and biological properties, making the drug act faster, stronger, and longer with a minimal dose [Rohit Sharma et al., 2022].

Thus, the Bhasmas as nanomedicines may offer a huge potential for designing new drugs employing the concept of nanotechnology.

XIV. MANAGEMENT OF NONCOMMUNICABLE DISEASES

With the successful conquest of communicable infectious diseases in the majority of the world, non communicable disease (NCD) has emerged as the greatest health threat of the modern era [Saklayen, 2018].

Moreover, Non communicable diseases impose a large financial burden on the economies of many countries. NCDs are chronic and long-lasting diseases that pose one of the most serious health issues today. In this quest, Ayurveda provides solutions to NCD prevention and the development of long-term habits for a healthy lifestyle. Ayurveda is a comprehensive lifestyle that improves general well-being, balances the mind and body, and guides humanity toward a healthy future.

According to the ICMR India State-Level Disease Burden Study report "India: Health of the Nation's States," the estimated proportion of all fatalities caused by NCDs has risen from 37.09% in 1990 to 61.8% in 2016.

The main risk factors for noninsulin-dependent diabetes are physical inactivity, poor diet, sedentary lifestyle choices, and stress. Ayurveda emphasizes the management of Prameha (Diabetes) by diet and life style changes (which can be correlated to diabetes) [Guddoye and Vyas, 2013]. Studies have also shown the effectiveness of Ayurveda intervention in the management of type 2 diabetes [Panda AK et al., 2017].

Keeping in view the strength of AYUSH system for the prevention and management of NCDs by promoting healthy lifestyle, a project aimed for "Integration of AYUSH (Ayurveda) with National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS)" was conceived in 2015 by the Ministry of AYUSH and Central Council for Research in Ayurvedic Sciences (CCRAS) in collaboration with Directorate General of Health Services, Ministry of Health and Family Welfare (MoHFW), for imparting health services on pilot basis in the three district of three states, namely Bhilwara (Rajasthan), Gaya (Bihar) and Surendranagar (Gujarat) and promising results were observed [Sharma et al., 2019].

XV. GERIATRICS

Future systems are characterized by sophisticated technology with a community responsibility for health and well being and a new approach to ageing i.e. Enhancing wellness scores over curing disease. Ten years from now, more patients will be living longer [Garson A et al.,2020] Many countries are experiencing an aging population, with a larger proportion of elderly individuals. One-fifth of the world's population will be over the age of 65 by 2050 [Ingle and Nath, 2008].

According to the most recent forecasts, the number of persons aged 80 and more will triple in the next 30 years. Many regions' 65-year-old population will double by 2050, while worldwide life expectancy beyond 65 will rise by 19 years.

[<https://www.un.org/development/desa/en/news/population/our-world-is-growingolder.html>]. This demographic shift emphasizes the need for specialized healthcare services and geriatric care. Advancement of age usually creates physical, psychological, emotional, and social problems.

Geriatric care needs to tackle two-fold problems: first, fundamental anti-aging care that reduces the rate of physiological ageing, and second, medical management of disorders that emerge exclusively in old age. Although, the quality of life may not be as important, conventional contemporary medicine appears to be strong in the management of old age-related health conditions. Ayurveda, on the other hand, has the potential for disease prevention through health promotion as well as disease management in old age [RaiAmit & Rai, Deepshikha R., 2018].

Ayurveda helps in managing chronic conditions commonly associated with aging, such as joint pain, arthritis, digestive issues, cognitive decline, and stress-related disorders. In functional and degenerative disorders that have a chronic or long standing nature. Rasayana therapy is the only solution for effective management in any system of medicine. Vayasthapana are specialized Rasayana drugs that arrest degenerative changes, increase life span with quality health [Tripathi, 2008]. Ayurvedic treatments often include natural remedies, herbal medicines, lifestyle modifications, dietary changes, which are generally well-tolerated by the elderly population compared to invasive procedures or strong pharmaceutical drugs [Stratton et al., 2023]. Ayurvedic Geriatric care (Jarachikitsa) and Rasayana methodologically delay ageing which begins at 60-70 years and reduce geriatric degeneration.

Ashwagandha (*Withania somnifera*), Amalaki (*Phyllanthus emblica*) are some of the Rasayana drugs which are used in old age. The integration of Ayurveda with modern medicine can provide a comprehensive approach to geriatric care, combining the strengths of both systems to improve health outcomes for the elderly. Geriatric care in Ayurveda is gaining recognition and importance, and it is likely to continue to do so in the future.

XVI. RASAYANA

Rasayana is a special branch of Ayurveda, which deals with methods of rejuvenation such as food recipes and regimens, herbal and mineral supplements, and health-promoting lifestyle choices that are thought to improve quality of life and delay aging [Udupa, 1973]. In fact the ideal time for treating the geriatric problems is youth. It is interesting to know the exemplary effects of the fruits of pomegranate (*Punica granatum L.*), which has shown the life-span and health-span enhancing action, when tested on *Drosophila melanogaster* (fruitfly) model. In the study conducted by [Balasubramani et al., 2014] there was a two fold increase infecundity, improved resistance to oxidative stress (H₂O₂ and paraquat induced) and to *Candida albicans* infection in pomegranate fed flies which demonstrate the rasayana action [Pathak P et al., 2011]. Exploring innovative ways to ensure healthy aging of populations is a pre-requisite to contain rising healthcare costs. Scientific investigation and research into the principles and practices of traditional remedies can yield new insights and simple answers for living a healthy lifestyle.

Ayurveda considers ageing as the Swabhavaja vyadhi i.e. it is inherent nature of the living being to get old. Ancient text Sarangadhara Samhita presents an interesting scheme of loss of different biological factors during different decades of life as a function of ageing. This is especially significant as it can provide a guideline for selection of age-specific organ-protective Rasayana to retard aging.

Table 1: Age Related Degenerations and Preventable Rasayanas

| Sl.No | Decades | Age related bio-losses | Restorative Rasayanas |
|-------|----------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 1 | 0-10 yrs | Loss of Corpulence (Balya) | Vacha (<i>Acorus calamus</i>), Gambhari (<i>Gmelina arborea</i>), Swarna (gold) |
| 2 | 11-20 | Loss of Growth (Vridhi) | Gambhari (<i>Gmelina arborea</i>), Bala (<i>Sida cordifolia</i>), Ashwagandha (<i>Withania somnifera</i>) |
| | 21-30 | Loss of Lusture (Chhavi) | Haridra (<i>Curcuma longa</i>), Kumari (<i>Aloe vera</i>), Louha |
| 4 | 31-40 | Loss of Intellect (Medha) | Shankhapushpi (<i>Convulvulus prostratus</i>), Brahmi (<i>Bacopa monnieri</i>), Jyotishmati (<i>Celastrus paniculatus</i>) |
| 5 | 41-50 | Loss of Skin glow | Jyotishmati (<i>Celastrus paniculatus</i>), Chironji (<i>Buchanania lanzan</i>), Bhrinjaraja (<i>Eclipta alba</i>) |
| 6 | 51-60 | Loss of Vision (Drishti) | Triphala, Jyotishmati (<i>Celastrus paniculatus</i>), Shatavari (<i>Asparagus racemosus</i>), Saptamrita Lauha |
| 7 | 61-70 | Loss of Virility (Shukra) | Kapikachu (<i>Mucuna pruriens</i>), Ashwagandha (<i>Withania somnifera</i>) |
| 8 | 71-80 | Loss of Strength (Vikram) | Bala (<i>Sida cordifolia</i>), Shilajeet, Ashwagandha (<i>Withania somnifera</i>) |
| 9 | 81-90 | Loss of Cognitive power | Brahmi (<i>Bacopa monnieri</i>), Mandukaparni (<i>Centella asiatica</i>) |
| 10 | 91-100 | Loss of Locomotive ability | Bala (<i>Sida cordifolia</i>), Ashwagandha (<i>Withania somnifera</i>) |

Certain recent studies on popular rasayana remedies like Amalaki (*Emblica officinalis*), Aswagandha (*Withania somnifera*), Guduchi (*Tinospora cordifolia*), Brahmi (*Bacopa monnieri*) and Chyavanprasha have shown evidence to suggest their efficacy as anti-aging remedies.

XVII. NAIMITTIKA RASAYANA

Based on the disease condition, specific Rasayana drug known as naimittika rasayana is administered such as Pippali Rasayana, Bhallataka Rasayana in Kusta (skin diseases) [Vashistha and Sharma, 2021]. It improves immunity, exhibits multidimensional activities like antioxidant, tissue protective, immune stimulant and improves quality of life. Rasayana play a vital role as they provide curative and health promoting effects during recuperation too.

XVIII. ACHARA RASAYANA

Achara rasayana is a unique concept in Ayurveda which refers to specific code of conduct, lifestyle and behavior and plays an important role in the prevention and management of psychosomatic disorders in future. It is a cognitive behavioral therapy that focuses on changing automatic negative thoughts that can exacerbate and contribute to emotional difficulties, depression, and anxiety. It is a cost-effective technique for reducing the global illness burden [Dhurgude et al., 2022].

XIX. MENTAL HEALTH

The corona virus pandemic has created a psychological havoc across nations. The classical texts of Ayurveda advocate certain principles to be followed in life for ensuring good physical and mental health, overall well-being, and optimum quality of life [Chandhok et al., 2022]. In Ayurveda, psychological and mental well-being is considered equally important as any other physical ailment. The principles of Ayurveda suggest the regime that individuals should follow to maintain optimum psychological well-being. For optimum, significant and long-term outcomes, knowledge and principles of Ayurveda are to be combined with modern-day psychotherapy to expand reservoir of coping resources. There are many herbal tranquilizers which are found safe and effective for long term use. Ex- Brahmi (*Bacopa monneiri*).

XX. WOMEN'S HEALTH

Polycystic Ovarian Syndrome (PCOS) is a common endocrinopathy faced by the women today. It is frequently associated with the reproductive system, resulting in menstruation abnormalities, infertility, obesity, depression, sleep apnea, insulin resistance, and, in time, diabetes mellitus, endometrial cancer, cardiovascular disease, and other complications. Ayurvedic therapies aid in reduction of the weight and also reduce the symptoms of PCOS. It aids in the reduction of insulin resistance by promoting ovulation, which is one of the most important aspects in the preservation of fertility [Mole et al.,2021].

Garbhini Paricharya (Antenatal care), which contains dietetic and other regimens advocated in Samhitas for pregnant women, is of great significance for future. Ayurveda give importance to antenatal care (Garbhini Paricharya) and postnatal care (Sutika Paricharya) which are well described in ancient classical texts. Now a days due to changes in life style, culture, food habits, hectic schedule, elective Caesarian Section has become a common phenomenon. Adopting good antenatal care practices helps normal delivery with good and

effective uterine contractions during labor and also leads to proper contraction of uterus after labor preventing post-partum complications [Dr. Sachin Mittal & Dr. Rajesh Gupta, 2016]. Treatment like Bala siddha taila matrabasti (enema with medicated oil) and Yonipichu(vaginal tampon)in 9th month of pregnancy helps in increasing tone, smoothening of pelvic region and related organs. Yoni pichu brings contractility of uterine muscle and helps in cervical ripening by altering the cervical matrix and helps in releasing prostaglandins [Malsariya et al., 2020]. Sutika paricharya (puerperium care) maintains maternal and infant health by preventing complication and establishing infant feeding. Abhyanga (Oil massage) during puerperal period causes toning up of muscles of pelvic floor, abdomen, back and vagina and prevents thrombosis [Verma et al., 2017]. Ayurveda can also be of great use in menopausal phase and as a substitute to hormonal therapy.

XXI. AYURVEDA AND TECHNOLOGY

Artificial Intelligence (AI) and Machine Learning (ML) has emerged as tools that hold potential to revolutionize the field of healthcare, including the practice of Ayurveda. AI and ML can assist in the diagnosis of diseases, suggest personalized treatment plans and optimize patient outcomes. By developing language models and algorithms that are specifically trained to understand and process Indian languages, researchers and practitioners can effectively leverage AI and ML techniques to extract valuable insights from Ayurvedic texts, medical literature, and patient records written in regional languages. This advancement facilitates better communication, knowledge sharing, and innovation within the Ayurvedic community, promoting the preservation and dissemination of traditional medical knowledge across diverse linguistic and cultural contexts. Natural Language Processing (NLP) can assist in the digitization and organization of Ayurvedic texts and ancient manuscripts, making them more accessible and searchable for researchers, practitioners, and enthusiasts. By extracting valuable information from these texts, NLP can aid in the discovery of new insights, formulations, and treatment approaches. Additionally, NLP can enhance the accuracy and efficiency of patient consultations by facilitating intelligent chat bots or virtual assistants. These AI-powered tools can understand patients' queries, symptoms, and medical histories in natural language, enabling personalized recommendations and advice. NLP algorithms can also analyze patient feedback and reviews, helping to identify patterns and improve the efficacy of Ayurvedic treatments.

Furthermore, NLP can assist in cross-linguistic research and knowledge sharing in Ayurveda. By enabling translation capabilities and language understanding, NLP can bridge the gap between different languages and cultures, allowing practitioners and researchers from diverse backgrounds to collaborate and exchange information effectively [Khurana et al., 2023].

Classification and regression are machine learning techniques that can be used in Ayurveda to make sense of patient data and improve treatment outcomes. Ayurveda, has also started embracing these technological advancements to enhance its reach and effectiveness. The integration of digital health and telemedicine in Ayurveda has the potential to expand the reach of this traditional healing system, facilitate personalized care, and improve patient outcomes [Vodička and Zelko, 2022].

XXII. TECHNOLOGICAL ADVANCEMENT

The digitization of Ayurvedic healthcare facilitates the collection and analysis of vast amount of patient data. This aggregated information can be anonymized and used for research purposes, leading to insights on the effectiveness of Ayurvedic treatments, identifying patterns in diseases, and supporting evidence-based practices. The application of data analytics and machine learning can further enhance the understanding of Ayurvedic concepts and refine treatment protocols.

The globalization of Ayush necessitates standardization, both at the national and international levels, in terms of terminology, clinical examination, diagnosis, health record maintenance, interventions in the form of herbs, herbal/herbo-mineral formulations, diet and lifestyle, drugs, and pharmacovigilance specific to these systems [Dua et al., 2023]. Ministry of AYUSH is actively engaging with WHO for development of Standardized Terminologies of Ayurveda, Siddha and Unani systems of Medicine for ex- Namaste portal.

- 1. Namaste Portal:** Namaste Portal is the comprehensive web-portal for Standardised Terminologies and National Morbidity Codes of Ayurveda, Siddha and Unani Systems of Medicine and WHO-ICD-10 and ICD-11 [Sheshagiri 2021]. The objective is to provide a single window access to the information and services being provided by Indian government for citizens and stake holders. It is being maintained successfully for the collection of Morbidity statistics through National Ayurveda, Siddha and Unani Morbidity codes.
- 2. Ayush Grid:** The Ministry of AYUSH has initiated steps to set up a nationwide digital platform called “AYUSH GRID” which aims to bring onboard all AYUSH facilities including hospitals and laboratories and to promote traditional systems of healthcare.
- 3. The Ayush Research Portal:** The AYUSH Research Portal is meant for disseminating the information related to the AYUSH and the current research updates purely meant for academic purpose.

XXIII. AYUSH STARTUP

Government of India is extending its support for emerging startups in Ayurveda. All India Institute of Ayurveda (AIIA) under Ministry of Ayush has launched “Ayush startups challenge” to encourage early start ups to work on innovation in Ayurveda and aims to recognize and endorse inventive startups operating in the Ayush domains while leveraging the potential of emerging technologies. For instance, Food Innovations in Ayush Sector - Ready to Eat Nutritious Ayurveda Ahara (Food), Ayush Bioinstrumentation (Hardware Solutions) and Innovations in healthcare enabling breakthrough performance in terms of better outcomes are some of the examples [https://www.startupindia.gov.in/content/sih/en/ams]. In order to recognize India’s age old principles of Ayurveda and the Aahara prepared as per ancient texts, Food Safety and Standards Authority of India (FSSAI) has formulated Food Safety and Standards (Ayurveda Aahara) Regulations, 2022 in consultation with the Ministry of Ayush and notified the regulations in the official gazette on 5 May, 2022. The regulations define “Ayurveda Aahara” a food prepared in accordance with the recipes or th ingredients or processes as per method

described in the authoritative books of Ayurveda listed under ‘Schedule A’ of these regulations [<https://pib.gov.in/PressReleasePage.aspx?PRID=1846185>].

XXIV. PHARMACOVIGILANCE

Medical pluralism is a growing trend and people are exploring various options including modern, traditional, complementary and alternative medicine. Global concern on drug safety paved way to pharmacovigilance. People are unaware of the need to be vigilant during use of herbal medicines alone or in combination with other medicines. People are of the notion that Ayurveda medicines cause no harm and self-medicate themselves. Drug herb interactions and medical pluralism are very common during these years. Many diabetes patients are known to take herbal remedies with anti-diabetic qualities in addition to their conventional therapies, which may provide both a benefit and a potential risk due to drug interactions. For instance Methi(Fenugreek) and Metformin are consumed by diabetic patients without knowing the probable drug interactions. Similarly, drug interactions between allopathic tranquilizers and Ayurvedic drugs (Brahmi and Alprazolam) for sleeplessness, Nonsteroidal anti-inflammatory drugs and Ayurvedic drug Guggulu (Commiphora mukul) for pain management are yet to be explored. [Way ahead for execution of pharmacovigilance programme. Dr. Shubhashree M N.]. Due to intrinsic pharmacokinetic and dynamic interactions, variability in herbal product compositions, unsupervised self-administration and lack of adequate knowledge about the ingredients and their pharmacological properties, there is a serious risk of potentially adverse herb-drug interactions.

Scientific validation and documentation of Ayurvedic medications are critical for quality assessment and global acceptance. Ayurvedic herbs therapeutic efficacy can be boosted by excellent quality, which can be attained through identification, purity, safety, drug content, physical and biological qualities. Ayurvedic remedies must be investigated using current scientific methodologies in order to be validated.

The Bureau of Indian Standards (BIS) is the National Standards Body of India which is involved in developing National Standards on products, processes, and services which are called as “Indian Standards.” At present, Ayush department in BIS is involved in creating standards for herbs and AYUSH related materials (equipment, instruments, Yoga accessories, etc.) corresponding to the International Standards.

XXV. AYUSH-GLOBAL SCENARIO

“AYUSH” refers to traditional and unconventional healthcare and natural healing systems such as practice of Ayurveda, Yoga, Naturopathy, Unani, Siddh and Homeopathy. Traditional medical systems, including Ayush systems, are significant and frequently underutilized health resources with numerous uses, particularly in the prevention and management of lifestyle-related chronic diseases and in satisfying the health demands of the aging population. Owing to the Health challenges of the 21st century, interest in Ayush system is undergoing a revival. The Declaration of Astana of the WHO, adopted at the Global Conference on Primary Health Care in October 2018, made clear that the success of primary health care will be driven by applying scientific as well as traditional knowledge, and extending access to a range of healthcare services, which include traditional medicines. It is

reported that 88% member states have acknowledged use of traditional medicines, which corresponds to 170 member states in WHO [Pradeep Dua et al 2023].

The WHO has also stated in the “WHO Traditional Medicine Strategy 2014 to 2023” that “for many millions of people, herbal medicines, traditional treatments, and traditional practitioners are the main source of healthcare, and sometimes the only source of care which is available close to homes, accessible and affordable. It is also culturally acceptable and trusted by large numbers of people. The affordability of most traditional medicines makes them more attractive at a time of soaring healthcare cost and nearly universal austerity.”

Appreciating the role of traditional medicines in health care, the WHO has set up a Global Centre for Traditional Medicine in Gujarat, India. It is noteworthy that Ayush experts are formulating ISO standards in collaboration with the BIS to augment the Ayush exports in the global market.

XXVI. INTERNATIONAL TRADE

In the recent past, there has been a huge international demand for Ayush products and services. In view of the huge potential for growth and export of Ayush systems, the Government of India has set up the Shellac and Forest Products Export Promotion Council with the mandate of export promotion of Herbal extracts. The Pharmaceuticals Export Promotion Council has been tasked with promoting the export of certain herbal products. The Export Development Authority for Agricultural and Processed Food Products encourages the export of Medicinal Plants. Recently, a dedicated Ayush Export Promotion Council has been established to facilitate all aspects of exports pertaining to the Ayush sector [Pradeep Dua et al 2023].

The important sectors are Healthy Eating, Nutrition, and Weight Loss (\$946 billion); Physical Activity (\$738 billion); Wellness Tourism (\$436 billion); Traditional and Complementary medicine (\$413 billion); Public Health, Prevention, and Personalized Medicine (\$375 billion). Ayush products are being traded into more than 100 countries either as medicine or as food supplements.

It is also the need of the hour to move toward the United Nations Sustainable Development Goal 3 (UN SDG 3) – Ensuring healthy lives and promoting well-being for all at all ages – By achieving Universal Health Coverage (UHC), addressing health emergencies and promoting healthier populations. Ayush systems can make a significant contribution to the goal of UHC by being included in the provision of essential health services.

High-quality health-care service delivery in conventional as well as Ayush systems, low cost, and proximity to some potential countries have made India one of the most popular destinations for medical value travel. Publication of an Indian standard IS 17942: 2022 “Tourism and Related Services – Medical Tourism – Service Requirements” as a modified adoption of ISO 22525: 2020 with inclusion of Ayush-related provisions is also poised to boost the Ayush sector.

XXVII. COSMETOLOGY

Consumers are going green globally specially in cosmetics market. Recently the growth of beauty products are driven by products that are natural or herbal and it has been increasing gradually. Ayurvedic Cosmetics are in demand as they are safe, the focus is more on translating ancient Ayurvedic formulas into the products of the modern world. Extracts taken from plants and other natural substances are formulated into cosmetic products like moisturizers, to provide a comprehensive beauty range serving mankind.

XXVIII. INTEGRATIVE MEDICINE

Integrative Medicine is a relatively new area that is widely recognized as a cost-effective problem-solving strategy that simplifies the management of incurable and complex conditions for which current medicine has nothing to offer. The creation of an integrated medicine health incubator is critical to the creation of a multidisciplinary program that offers to minimize healthcare costs, out-of-pocket spending, and stresses preventative healthcare as a means of achieving a healthy population in a developing country like India [Anand et al., 2017]. Integrative healthcare centers are functioning at prestigious institutes like All India Institute of Medical Sciences (New Delhi), National Institute of Mental Health And Neuro-Sciences (Bangalore).

Affordability, accessibility, and availability of health care, as well as disproportionate growth and illness burden, have emerged as key challenges in India. Emphasizes the need for a shift in thinking from illness-disease-drug-centric curative techniques to person-health-wellness-centric preventive and promotive approaches [Patwardhan et al., 2014]. NITI Ayog the apex public policy think tank of Government of India is also developing action plan for states to include AYUSH in addressing health and nutrition issues. It is closely working under cooperative federalism to look at gaps to integrate with AYUSH. Integrative treatment protocol is developed by conducting robust integrative research studies. NITI Ayog is working towards making AYUSH part of child development program, early childhood program and school health program.

The novel idea of the integration of health care with modern and traditional medicine, helps the patients with curable and incurable disease through a more scientific approach. For example considering the incurable nature of muscle dystrophy patient the main focus could be on complementary and alternative approach, which includes Ayurveda, known to improve the health of incurable muscle dystrophy patients. Treatment with the yoga and physiotherapy could also be provided which may improve their health at greater level [Anand et al., 2017].

XXIX. COLLABORATIVE RESEARCH

Collaborative research efforts can help enhance the understanding, credibility, and acceptance of Ayurveda both within and outside of traditional Ayurvedic communities. Collaborative research brings together experts from various fields such as Ayurveda, modern medicine, pharmacology, biochemistry, and other relevant disciplines. By conducting rigorous scientific studies, researchers can validate the efficacy and their safety measures of Ayurvedic treatments and medicines. This scientific validation is crucial for gaining wider acceptance, integrating Ayurveda into mainstream healthcare systems, and promoting

evidence-based practices. Ministry of Ayush is conducting the world's first multicenter Phase - III clinical trial examining the efficacy of Ayurveda in the treatment of Rheumatoid Arthritis. The clinical trial is conducted in accordance with stringent International Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use - Good Clinical Practice (ICH- GCP) guidelines. Such Collaborative Projects can propel Ayurveda system of medicine on a global scale into the future.

The Ayush Information cell helps in global promotion and propagation of AYUSH systems of medicine which would lead to signing of Memorandums of Understanding (MoUs) with foreign Governments/ Universities/Institutes, for Country to Country cooperation in the field of traditional systems of medicine, setting up of AYUSH Academic Chairs and undertaking collaborative researches [<https://hcikl.gov.in/pages>].

Ministry of AYUSH has signed 23 Memorandum of Understanding(MoUs) for collaborative research with various universities in and around the countries such as Austria, Germany, Brazil, Canada, WHO, Geneva, Argentina, Israel, Australia, Tajikistan, Ecuador, etc and also signed another 13 MoUs for establishing AYUSH academic chairs in western institutes, universities, industries in countries like Mauritius, Russia, Argentina, Malaysia, Bangladesh, Latvia, Trinidad &Tobago, etc .
[<https://pib.gov.in/PressReleasePage.aspx?PRID=1694455#>].

The All India Institute of Ayurveda (AIIA), the apex institute of Ayurveda in India under the Ministry of AYUSH, and the National Institute of Advanced Industrial Science and Technology (AIST), Japan has signed a MoU for academic establishment. AIST is a reputed and one of the largest public research organizations in Japan, focusing on technologies and on “bridging” the gap between innovative technological seeds and commercialization [<https://pib.gov.in/PressReleasePage.aspx?PRID=1865904>]. The MoU will enable in countries to promote research collaboration and building capacities in the field of the Indian Ayurvedic system of traditional medicines. All these activities will be executed in support of the Ministry of Ayush.

In January 2020, Indian Institute of Technology, New Delhi and the All India Institute of Ayurveda signed a Memorandum of Understanding to study the therapeutic benefits of herbal formulations and wellness. Seven concept focused to collaborate on various new Ayurvedic formulations and their practices for next two years problems. It includes –

1. Evaluation of six Ayurvedic juices on gastrointestinal impact by the result of secretions.
2. Developing herbal formulations to reduce the harmful effects reusing of cooking oil.
3. Developing a natural cum biodegradable wound dressing by herbal formulation.
4. Developing ‘Dhoopan Yantra’- a new strategies as fumigation process against wound healing as a device.
5. Evaluation of ashes and their influence on proteins associated neurodegenerative diseases.
6. Study on effective ‘Bhramari Pranayama’ on nervous system and their functions.
7. Gauge the Ayurvedic drugs impact on early detection of cancer and their assessment against to breast cancer.

XXX. CONCLUSION

Ancient treatise Charaka Samhitha states that new ideas are to be incorporated from the world around and learnt. One has observe and learn from the world around. Ayurveda is a dynamic science and a constant learning process. Sushruta also supports the idea with his quote “*Ekamshastramadhiyanonavidyatshastranisachayam, tasmatbahushrutahshastramvijaniy atchikitsakah*” which implies open mind is quintessential to appreciate the greatness of any science. Without having the knowledge of other branches of science, one cannot conclude that it is the best, therefore a physician should study many scriptures.

The concepts of Ayurveda conveyed thousands of years back are relevant now and will continue to do so in the future. The heightened awareness about the efficacy of herbal and traditional medicines as well as surge in research and developmental activities, management of chronic diseases have expanded the scope of Ayurveda.

Ayurveda has gained popularity outside India, and its recognition as a valid healthcare system may continue to grow in the future. It is hoped that ancient wisdom coupled with advanced technology would be more beneficial for the mankind in future.

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