

## **A comprehensive survey on the importance of Ayurveda and Artificial Intelligence**

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### **Abstract:**

In the modern world, modern medicine and complementary systems dominate the healthcare worldwide. Many developing countries which suffer with resources can improve the healthcare at their retention by leveraging the extent of traditional medicine. A traditional Indian Atharva Veda implemented system of medicine called the Ayurveda, has gigantic benefits to human kind. This way of medicine deals majorly with naturally available herbs and methodologies to treat human health and promotes healthy practices for a better lifestyle. Ayurveda works on the idea of balancing biological systems. Ayurveda is primarily accomplished in India and being recognized internationally due to the effectiveness and use of naturally available herbs and associated methodologies to cure the diseases. Ayurveda as a system is successful, yet not widely practiced, there are range of reasons that has limited Ayurveda to reach its potential, such as less importance is given to Ayurvedic education and its practices, very few or no advancement is seen, resources limitations due to funds, limited technical support, and unstructured database. Therefore there is a constant need of improvising the field with technology and effectively creating knowledge based systems to improve the practice of Ayurveda and to optimize its benefits. In this paper, a survey on the benefits of Ayurveda for women hormonal imbalance, Ayurveda for Skin and Hair health is done along with the Artificial intelligence technology advancements in the field of Ayurveda. The intend of the paper is to layout the benefits this 5000 years old approach towards medicine has to offer and the use of Artificial Intelligence to promote and influence its growth.

**Keywords:** Medicine, Ayurveda, traditional approaches, herbs, imbalances, hair, skin, knowledge based system, artificial intelligence.

### **I. INTRODUCTION**

A transitional phase in Etymology or medicine is happening every passing day, by discovering new diseases and to find better medicinal solutions, it will always be intending to discover new studies which will lead to new and improvised choices. Ayurveda is considered to be one of the oldest system of medicines and it stands on the ancient practices that proved to be the best and no side-effects inducing cure. The Atharva Vedas wrote an ancient universal approach to both physical health and mental health which depend on “natural ways”. Ayurvedic treatments are harvested using plants, animals, minerals and metals; but plants predominate in these treatment and will be combined with diet, fitness activity, lifestyle changes to form an effective treatment. Though Ayurveda was being practiced from ancient old age and was one of the primary medical treatment approached in India, it was officially recognised by the World Health Organisation (WHO) in 1976. The potential of Ayurveda is huge, yet lack of continuity in research and implementation is doomed the growth of this effective medicinal approach. Ayurveda initially practices preventive measures, such as meditation, nutritious food and yogic practices; if the Rogi (Patient) incorporate these measure, he/she will be able live a healthy life style. The Ayurvedic way of living can benefit in multiple ways such as, reduce stress, underlying body imbalances which causes multiple health problems and many more. This generation faces many health issues due to the modern living. Adults, Men, Women and children will be benefitted by the Ayurvedic way of living as it involves best practices in diet and exercise. This survey is intended to understand the benefits of

Ayurvedic medicine on skin, health and body hormonal imbalances, the advantages and disadvantage imposed by Ayurveda, Popular Ayurvedic institutions and research contributions to the field of Ayurveda, the use of AI in Ayurveda and the future of Ayurveda when combined with Artificial Intelligence.

## II. HISTORY OF AYURVEDA

The derivation of Ayurveda Medicine methodology is accredited to “Atharva Veda” which records all the diseases from the Vedic age and their associated ayurvedic treatments. The advancements were seen from the sixth century in the BC, to seventh century in the AD with a systematic development of science which was coined as “Samhita Period”. This era saw several Vedas (Ayurvedic Doctors) contributing to organising the medical care based on evidence.[1] Therefore it is beneficial to start by exploring the history and origin of Ayurveda. The fundamentals of Ayurveda applies to people of all age and are based on human elements. Ayurveda believes that factors such as change in environment, modern lifestyle can alter the existing disease patterns but the human being inherits most of the similar factors from their ancestors, therefore the reactions and symptoms are logically similar and henceforth might differ in symptom’s appearance but would remain the same in its elemental approach.

The systematic development of Ayurveda started with the inventors and contributors of the medicine type. The following table gives an overview of the contributors of Ayurveda and their documentation.

**Table1: Popular Ayurvedic Books which record the invention of Ayurveda**

| <b>Name of the Book &amp; Origin Date</b>                                     | <b>Description</b>   |
|---|--|
| Caraka Samhita<br>(Origin : Uncertain – 600 BCE)                              | The most popular and renowned book for ayurvedic practices till date. It has an anthology of Ayurveda medical information, ayurvedic aspects such as symptomatology and treatments.[2] |
| Susruta Samhita<br>(Origin : Uncertain – 600 BCE)                             | Invention of surgery, medical diseases, eyes diseases. Improved methodology to ayurvedic treatment with surgeons.[3]   |
| Astanga Samgraha and Astanga Hridaya<br>(Origin : 2 <sup>nd</sup> century AD) | Emphases is done in the following 8 parts: General Ayurvedic Medicine, Aphrodisiac, paediatrics, diseases of sense organs, gerontology, mental health and Surgery.[3]                  |
| Bhavaprakasa<br>(Origin : 10 <sup>th</sup> to 16 <sup>th</sup> century AD)    | Most influential and structured work which deals with diseases and drug compositions. [3] this book is considered to be the most recent in Ayurveda literature.                        |
| Others<br>(Origin: 11 <sup>th</sup> century AD)                               | There are few more books before Bhavaprakasa which were cakra data, Bhav Misra.[3]   |

This section is intended to give a view of the origin of Ayurveda, how it has evolved and the books that retain the knowledge generated during the era. Table 1 is a list of book which majorly has all the medicines and discoveries recorded. If Artificial intelligence has to be applied to Ayurveda, proper data formatting is necessary and these books can give us the original insights of Ayurveda. Though the backside and hinderance to the growth of Ayurveda was caused by not recording the discovering or unstructured records. Though all the books are widely referred, much work needs to be done in data mining to get the right and optimized information of the Ayurvedic fundamentals, its cure, its effects and evolution. Ayurveda in modern world is thriving hard to prove its effectivity and use of improvised tech can help improve the whole domain.

### III. Ayurvedic Cure

Ayurvedic medicines have prevailed even with the existence of modern medicine, this directly implies to the potential this method of medicine has to offer. In this section we will go through a series of issues that are effectively solved using ayurvedic medicine. The issues related human body imbalances, skin, hair, internal organs balancing, chronic diseases and the most recent immunity involved Covid-19. The fundamental principles of Ayurveda are immortal, therefore the current need of integrating technology to this method of medicine is important and widely help the human kind solve their problem with nature-based solution.[4]

**Fundamentals:** Ayurvedic treatments starts by determining the Doshas of an individual, the practitioner tries to analyse and under the imbalance cause in any of the Doshas. According to Ayurveda there are three Doshas also called as Tri-Doshas, they are Vatta, Pitta and Kapha. All the studies are initially focused on determining a person’s tri-doshas and based on the symptoms and analysed doshas.[5] The treatment is personalized, in the ancient era, all the Vedas believed that every individual has different reaction to a particular substance or an element therefore determining the tri-doshas form the pivotal step.

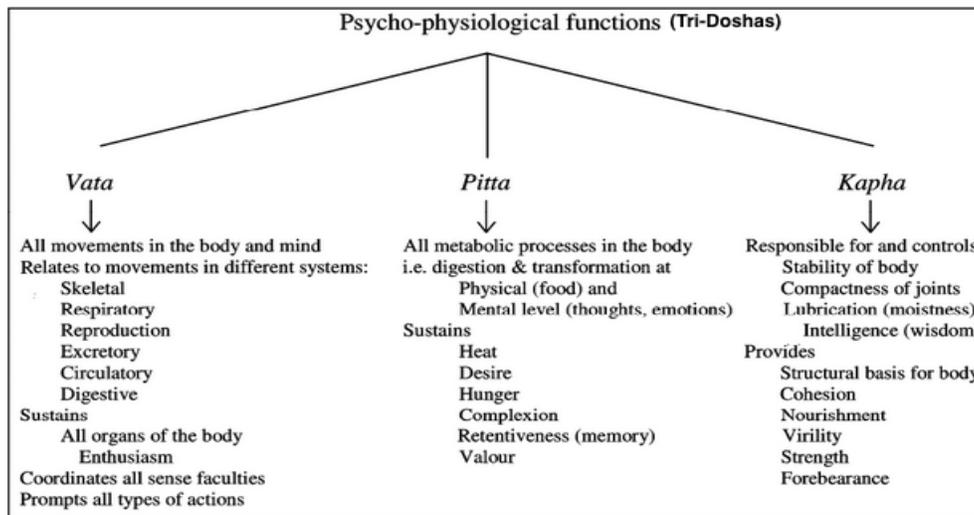
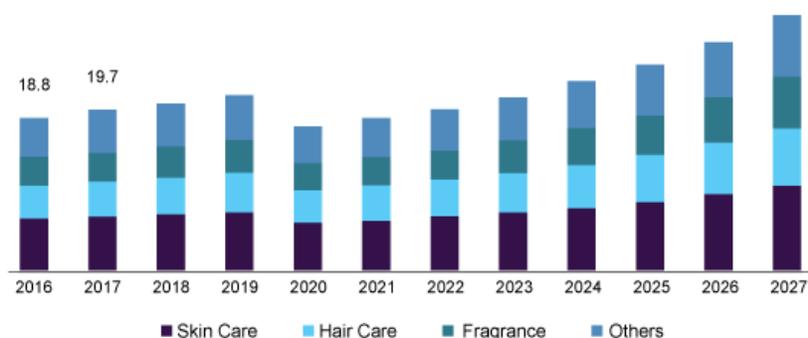


Figure 1 : The Fundamental classification of tridoshas (Source :<http://indiafacts.org/ayurveda>)

**Ayurveda for skin and hair:** Ayurveda has seen the most success in the field of skin and hair, in the recent times. The herbal domain is advancing in the 21<sup>st</sup> century, the ingredients used by the ayurvedic industry is majorly considered over chemical based ingredients [6]. In [7] the author explains that the beauty ingredients used for skin care oils / face packs , tonic for hair and skin, hair gels, creams for hair and skin have over and over been proved to be effective over the composition of chemical elements. In [8] the author sheds light over the benefits Ayurvedic ingredients have offered to enhance beauty as well as overall health of an individual. Many companies have gained attraction of huge client based, because they offer custom based Ayurvedic product based on a persons tri dosha, since the individual needs of beauty standards are met, the application of Ayurveda in solving the problem of skin, hair and overall beauty is trending[9]. Therefore the herbal industry division in Ayurveda is seeing rapid advancements.[10]



**Figure 2 : Ayurvedic Market forecast for hair and skin care product (Source : <https://www.grandviewresearch.com/>)**

In figure 2, we see the growth of Ayurvedic based Hair and Skin care across the globe, this industry has seen the most success.

**Ayurveda for Cardiology:** The study of Cardiology is known as “Hridroga” in Ayurveda. In [11] the author review the use of several herbs and drugs that help in prevention and treatment of Hridroga, the emphasis is greatly given on the combinational approach of having good food ,exercise and preventing bad habits. [12] the research explains the benefits of Ayurveda to prevent and treat is humongous, but there is a need to understand the patterns, fetch relevant data and use appropriate techniques.

**Ayurveda for Chronic diseases:** for more than five thousand year, Ayurveda is serving the mankind, the science and knowledge[13], its name suggest is focused on disease management. It has major emphases on preventive and controlling measures and promotes wellness. Ayurveda helps in solving the chonical diseases by balancing the 5 components of nature which are categorized into three energy bodies in Ayurveda, the tri doshas. The treatments are majorly based on regular healing by detoxification popularly known as “Panchakarma”, combined with reconstruction therapy known as “Rasavana” which is extracted from herbs. [14]. Ayurvedic approaches when combined with other ways of medicines such as modern medicine , Unani and more can form a more effective holistic approach to solve chonical diseases[15]. In [16] the author presents a summary of amalgamated medicine which can contribute to global crisis in managing chronic diseases. It shows 75% of cost was reduced when ayurvedic medicine is incorporated with others.

**Ayurveda for Women health:** The imbalance in women is due to many factors such as hormonal imbalance, deficiencies, skin and hair related issues, diabetes, pregnancy and more. It is very risky for women to rely on chemical based combinational treatments and solutions[17]. In [18], the author writes about the benefits of ayurvedic treatment in treating PCOS and PCOD which is caused by the hormonal imbalance, the detox Ayurvedic technique is said to play a major role in hormonal imbalance. In [19] , the authors review the causes of infertility in women, and suggest that it could be solved by using mixture of herbs, modifying lifestyle, diet, reduce anxiety and stress is the most common ayurvedic approach. In [20], an ayurvedic based chocolates based nutritional supplement for the infertility issues is studied, the study shows the enhancement of ovulation and hormonal function, this method is called the “chocolate drug delivery”. Another serious problem faced by a women is the menopause, menopause is considered to be alarming the individual towards paying attention to the body. In [21] the author explains a menopause specific ayurvedic detoxification to help control menopause and to balance the hormones. Majority of problems faced by the women is due to hormonal imbalance and Ayurveda has proven to be the most effective, less side effect based choice of medicine.

**Ayurveda for Surgeries:** Recently Ayurveda was in the news because of the debate to allow Ayurvedic professionals to conduct surgeries like the other modern medicine professionals. This buzz was created by the newsletter from the Central Council of Indian Medicine that granted rights to the Ayurvedic surgeons who studied “Shalya Tantra” and Professionals who postgraduates in “Shalakyta Tantra” to perform list of modern surgeries as the professionals are claimed to have enough competency and knowledge to perform [22]. The popular entity who firmly carries the

traditional method of Ayurveda called “AYUSH” has come forward with suggestion to take both in favour and against the favour audience. The lack of technological influence has left the potential of Ayurveda not fully discovered. Therefore multiple attempts have been sketched to improvise and stand firm the medical domain. [23]

**Ayurveda for Immunology:** The most popular concept studied in Ayurveda is the Bala or Ojas (immunity), immunity serves the human to fight major health issues, protecting and enhancing the same is the objective of many medicinal approach. Ayurveda suggests that the resistance from the body is highly essential to carry out day to day activity without being effected by diseases. The approach of providing immunity boosters an enhancers using herbs and exercises has been popular since ages [24] but has been put light on, during the recent outbreak of the novel Coronavirus also known as Covid-19, this disease takes a toll at immunity and modern medicine or any field of approach didn't have readily available solution. But the knowledge of Vedas helped majorly in taking preventive measure and boosting immunity. Multiple research papers on this dangerous virus have been published and the importance of using herbs is emphasized. Ayurveda has been a major contributor to the human kind to help fight this immune attacking disease. Therefore, if the advancement and proper findings are supported in Ayurveda the field as major potential in solving dangerous immunological diseases and helps in enhancing the immune system with day to day diet[25].

In this section, the review on most successful field of Ayurveda has been studied, Ayurveda undoubtedly has major potential but hasn't able to keep up to the industry is due to unstructured documentation, very less data out for the public to understand its benefits and very little help from other industries which has clogged the growth of Ayurveda, after understanding the field of Ayurveda, the answer to all the problems faced by Ayurveda can be solved by Artificial Intelligence. In the next section, the review on how artificial intelligence is used to solve problem in Ayurveda is explore.

#### IV. Artificial Intelligence For Ayurveda

Ayurveda stands prominently from the Vedic age yet the new generation has trouble understanding and using the research laid out by the Vedas. This is due the technological advancement in other fields of medicines, which has overshadowed multiple aspects of Ayurveda. In this section we will explore how applying artificial intelligence can be challenging and positively contribute to Ayurveda. Initially because of the unstructured data and it will take multiple domains such as data mining, pattern recognition, machine learning, natural language processing and more to connect the years old documented research. Ayurveda has vast source of knowledge yet to be discovered. Therefore artificial intelligence can be a boon to research, development and implementation in Ayurveda. [26]

It is evident that the treatments recommended in Ayurveda are dependent of determining tridoshas, therefore it makes sense to automate the detection of tridoshas of a human so as to help the practitioner save time that would otherwise be consumed during manual analysis. In [27] the author demonstrate a prediction of body constituents using multiple Machine Learning (ML) algorithms, with a precision of 95%, this methodology was proposed as a support system to Ayurvedic Doctors. Vatta, Pitta and Kapha are the classifications to understand what a human suffers, according to the Ayurvedic approach a human can have a combination of these doshas and each dosha exhibits certain characteristics. Artificial Intelligent models can be deployed to learn and predict the doshas much more accurately.

As depicted in the previous section, Ayurveda is very successful in the Hair and Skin care industry, this industry has seen growth and multiple AI techniques are applied, such as recommending skin care based on the doshas, recommending diet to support the skin care and recommending yoga to make the combinational approach more specific and effective. Many companies have come up with AI based recommendation system and have seen a positive growth rate. In [28] the author outlines a section on how machine learning can be used to determine the herbs, multiple other AI based methods such as image recognition, labelled based training and more have been deployed. The problem found is the non-availability of datasets for the algorithms to be trained efficiently and effectively.

Another area of Ayurvedic study where AI is applied, is the drug discovery. Artificial intelligence algorithm such as the classification based algorithms or deep learning based algorithms can be used to learn the patterns in drug discovery , recommend combination of drugs to solve similar issues, optimize drug usage and structure the knowledge base for further research.

Ayurveda has been very beneficial to women health and welfare, from controlling weight, managing stress, improving sleep, maintaining hormonal balance and managing the best health during pregnancy for both the women and unborn, Ayurveda has natural solutions for all these conditions and more. Artificial intelligence can be deployed to have a recommendation system on every single domain, this will help the women get the best out for their health in a cost effective manner. Therefore Artificial intelligence can be used in every aspect of Ayurveda to make the most out of the discoveries and to promote audience knowledge and can help provide health care for the developing or under developed countries who are unable to access high end drugs or medicines.

#### **V. AI implementation challenges for Ayurveda**

Though Ayurveda is gaining support from many domains to improvise and implement there are many challenges that are associated with deploying Artificial Intelligence to Ayurveda.

- Every book mentioned in Table 1 has diverse approaches, to train the AI model, there has to be a standard approach, therefore Ayurvedic doctors need to work on the standardisation of the approaches or prioritizing the approach based on the trial and error method.
- No enough documented data about the effectiveness of the available for the AI expert to refer therefore, deployment of feedbacks after Ayurvedic treatment Is recommended.
- Ayurvedic professionals and AI experts need to work together to understand the automation, this involves cost, interest of the professional. This would be a challenge if research is done individually. A combined effort from the government or organisation is recommended.
- Development of Ayurvedic care centres is important, deploying technologies to book online appointment, entering data before meeting the practitioner and more is not seen and therefore data is not collected in the required format. Deploying such basic data collection techniques can help automate other processes.
- Knowledge based databases should be created in every subdomain of Ayurveda, on which an AI model can be deployed. This method of data collection is not seen, majorly manual collection is done which is deprecating the practices after the practitioner stops serving.

Major challenges are imposed due to the unstructured operation of ayurvedic doctors around the country, if the field has to see next level technology deployment , advances in data structuring needs to be made, as AI majorly depends on the dataset collected. Based on the survey from the above sections, it is recommended that more and more efforts on data collections, feedback collection, effectiveness of a particular or all the methods need to be properly documented and automated.

#### **VI. Conclusion**

The concern for Ayurveda and its growth is the motivation for this paper, following the acceptance globally after the coronavirus outbreak. The need of growing with the market need has been intensified. To make the ayurvedic medicine and care available to wide range of population, the challenges faced currently needs to be taken into account. Integrative approach with other medicine to achieve a holistic methodology comes with challenges as the other medical fields have much more advancements when compared to Ayurveda. Many books and scripts are available to the researchers from the inventors and researchers of Ayurveda, putting that information to optimum use can give Ayurveda fuel to grow faster. Use of Artificial intelligence is trending in many domains such as financial, education, business, modern medicines and more. This influential technology can help solve the problems and to make a structured approach to systematically continue deploying new and improvised Ayurvedic technique, many algorithms such as decision tress, random forest, SVM , deep learning algorithms, image processing techniques, pattern recognition and more can significantly add value to ayurvedic exploration and help the field grow its potential.

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