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Artificial Intelligence in Ayurveda: Crafting personalized care for delivering Ayurvedic obesity management strategies

Tara. B *

Assistant Professor, Department of Kayachikitsa, Bapuji Ayurvedic Medical College, Shivamogga.

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Abstract

Background: Artificial intelligence (AI) has emerged as a powerful tool in health care, and its integration with Ayurveda in managing obesity not only ensures promising results but also enhances accessibility while maintaining a holistic approach.

Aims and Objective: This review aims to explore the advantages of incorporating AI in management of *'Sthoulya'* roga through personalised diet and treatment plans and real time monitoring of health parameters.

Literature Review: A comprehensive literature search was conducted to identify relevant studies and articles on the integration of AI and Ayurveda in management of *Sthoulya*. The search included databases such as PubMed, Google Scholar, and relevant journals.

Result: The integration of AI into Ayurvedic treatment for *Sthoulya* yields numerous benefits like multi-dimensional analysis of data, such as genetic, lifestyle, and environmental factors, of an individual along with his Prakriti and root imbalances causing obesity. These systems enable dynamic adjustments to dietary plans, *oushadhi* and lifestyle recommendations by real time monitoring of one's *Naadi*, *Jihwa* and other components of *roga rogi pareeksha* ensuring treatments remain relevant and effective.

Conclusion: By combining AI's analytical and predictive abilities with Ayurveda's time-tested, holistic principles, this synergy allows for highly personalized, preventive, and corrective healthcare solutions.

Keywords: *Sthoulya*; Ayurveda; Artificial Intelligence; Obesity; Integrative Medicine; Personalised Healthcare

1. Introduction

Ayurveda is inherently a holistic science that emphasizes an integrated approach to treatment. It views the body, mind, and spirit as interconnected, promoting balance for overall well-being.

Sthoulya (obesity) is a growing health concern, with its prevalence steadily rising due to modern lifestyle changes and improper dietary habits. It is a significant *Santarpanajanya Vikara* (disorder caused by overnutrition), marked by the excessive accumulation of *Medo Dhatu* (adipose tissue). The current lifestyle and food choices play a crucial role in its progression.

In today's fast-paced world, where stress, sedentary habits, and processed foods dominate, Ayurveda offers time-tested wisdom to achieve and maintain a healthy body weight. The integration of Artificial Intelligence (AI) in Ayurvedic

* Corresponding author: Tara. B

management of *Sthoulya* is a promising approach, enabling personalized diet plans, predictive analysis of metabolic disorders, and real-time monitoring of health parameters. AI-driven tools can enhance the precision of Ayurvedic diagnosis and treatment by analyzing individual *Prakriti* (body constitution), Dosha imbalances, and lifestyle factors, thus ensuring more effective and sustainable weight management.

The ICMR-INDIAB study highlights the growing prevalence of obesity in India, with significant variations across urban and rural areas. Urban regions report higher obesity rates due to lifestyle changes, dietary shifts, and reduced physical activity. The study emphasizes the urgent need for public health interventions to address this rising epidemic and its associated health risks [1].

Although Ayurveda is an ancient science, its principles remain profoundly relevant, adapting seamlessly to modern advancements while preserving its holistic essence to promote optimal health.

2. Materials and Methods

2.1. Literature Search

A comprehensive literature search was conducted to explore the integration of Artificial Intelligence (AI) with Ayurveda in the management of Sthoulya (obesity). Databases such as PubMed, Google Scholar, and relevant Ayurvedic journals were utilized to identify pertinent studies and articles. The search terms included combinations of "Artificial Intelligence," "Ayurveda," "Sthoulya," "obesity," "Apatarpana," and "personalized healthcare." The collected data were analyzed to provide a clear overview of the topic.

2.2. Ayurvedic Management of Obesity

Sthoulya, or obesity, is recognized in Ayurveda as a *Santarpanajanya Vikara*—a disorder arising from over-nourishment. Acharya Charaka prescribes *Apatarpana* (reducing nourishment) as the primary treatment approach for *Sthoulya*. This involves a diet that is *Guru* (heavy to digest) yet *Apatarpaka* (reducing in nature) and low in calorific value [2]. The rationale is to provide sustenance that satiates hunger without contributing to further adipose accumulation.

2.3. Dietary Recommendations

In formulating a *Guru Apatarpaka* diet, it is crucial to include all necessary nutrients to prevent deficiencies. Ayurvedic texts recommend several dietary components with these properties:

- ***Shuka Dhanya* (Cereals):** *Yava* (barley), *Kodrava* (kodo millet), *Purana Shali* (old rice), *Priyangu*, and *Laja* (puffed rice).
- ***Shami Dhanya* (Pulses):** *Mudga* (green gram), *Rajamasha* (black gram), *Kulatha* (horse gram), *Chanaka* (Bengal gram), and *Masura* (red lentils).
- ***Shaka* (Vegetables):** *Shigru* (drumstick), *Patola* (pointed gourd), *Mulaka* (radish), *Karvellaka* (bitter gourd), *Vartaka* (eggplant), *Tanduliyaka* (Amaranthus), and *Kushmanda* (winter melon).
- ***Phala* (Fruits):** *Kapitha* (wood apple), *Jambu* (Java plum), *Amlaki* (Indian gooseberry), *Bibhitaki* (Terminalia bellarica), *Haritaki* (Terminalia chebula), *Dadima* (pomegranate), and *Erandakarkati* (papaya).
- **Beverages:** *Takra* (buttermilk), *Madhu* (honey), *Ushnodaka* (warm water), *Tila Taila* (sesame oil), and *Sarsapa Taila* (mustard oil) [3].

These ingredients can be transformed into tasty and health-promoting dishes that balance *Vata* and *Kapha doshas*. Ayurveda emphasizes not just taste but also the therapeutic value of food, creating meals that nourish both body and mind.

2.4. Therapeutic Interventions

Beyond dietary modifications, Ayurveda recommends specific therapeutic procedures for managing *Sthoulya*:

- ***Panchakarma* Therapies:** Procedures such as *Vamana* (therapeutic emesis), *Virechana* (purgation), and Basti (medicated enemas) especially *Kshara basti* are employed to eliminate accumulated doshas [4]. Before *Vamana* or *Virechana Snehapana* can be done with *Thila thaila* has shown significant results.

- ***Ruksha Udvartana*:** This involves dry medicated powder massage to promote lymphatic drainage and reduce subcutaneous fat.
- **Medohara Yogas:** Herbal formulations that specifically target the reduction of *Medo Dhatu* (adipose tissue) like *Medohara Guggulu, Navaka Guggulu*, *Triphala Choorna*, *Guggulu tiktakam Kashaya, Medohara Vidanga louha*, are prescribed to aid in weight management [5,6].

2.5. Application of AI in Ayurveda based management of Obesity

Artificial Intelligence (AI) can revolutionize Ayurveda-based obesity management by integrating ancient wisdom with modern technology.

- **Personalized Treatment Plans**: AI can analyze an individual's *Prakriti* (body constitution) and *Dosha* imbalances to recommend tailored Ayurvedic *Pathya* (wholesome practices), including personalized *Ahara* (dietary modifications) and *Vihara* (lifestyle adjustments) for optimal health and balance.AI-driven tools can assess an individual's *Prakriti* based on questionnaire inputs, genetic factors, lifestyle habits, and physiological parameters [7]. Unlike traditional manual assessments, AI can ensure precision by analyzing large datasets and reducing subjective errors.
- **Real-Time Monitoring**: AI-powered health trackers can monitor symptoms, lifestyle patterns, and adherence to Ayurvedic regimens while tracking users' progress to provide instant feedback. This is particularly beneficial for individuals with obesity, as they often struggle to maintain dietary and lifestyle changes. Continuous monitoring and personalized guidance help prevent relapse, ensuring sustained weight management and overall well-being. AI-integrated health apps and wearable devices can track key health parameters such as weight fluctuations, digestion patterns, sleep quality, and energy levels. By providing real-time feedback, these tools enable dynamic adjustments to Ayurvedic treatments, enhancing their effectiveness and long-term sustainability
- **Customized Diet & Lifestyle Recommendations through AI:** The application of AI in Ayurveda opens up opportunities for crafting personalized, tasty, and healthy diets based on the *Ahara* guidelines prescribed by Acharyas, such as Guru (heavy to digest) and *Apatarpana* (reducing nourishment). AI can analyze individual preferences, availability of ingredients, and health goals to create sustainable and dosha-balanced meal plans.

Key contributions of AI in this area include

- AI can generate personalized diet plans based on Ayurvedic nutrition principles, considering factors like *Rasa (taste)*, *Guna (properties)*, and seasonal variations (*Ritucharya*).
- Ingredient Availability: AI can adapt dietary recommendations to the ingredients accessible to the patient, ensuring practicality and ease of implementation.
- Caloric Planning: Accurate calorie calculations and portion control align diets with weight management goals without compromising essential nutrients. It can suggest optimal meal timings, portion sizes, and food combinations to balance *Doshas* and manage conditions like obesity.
- *Doshic* Balance: Advanced algorithms can sense and adjust for the balance of *Vata*, *Pitta*, and *Kapha*, ensuring that the meal plans align with Ayurvedic principles for holistic health.
- **Lifestyle recommendations:** including *Dinacharya* (daily regimen) and *Ritucharya* (seasonal regimen), can be tailored based on AI analysis of an individual's habits and environmental conditions.
- **Yogic Practices for *Sthoulya* Management**: The incorporation of *yogasanas* (postures) like and *Pranayama* (breathing techniques) and meditation significantly enhances the management of obesity. AI-powered fitness applications can recommend *Vata-Kapha-hara* asanas such as: *Ardhakati chakrasana*, *Trikonasana*, *Surya Namaskara, Matsyendryasana, Vajrasana, Pavanamuktasana, Dhanurasana Trikonasana, Setubhandasana*, *Pranayama* like *Kapalbhati*, *Bastrika* and *Bramari* [8].
- **Data-Driven Insights:** By analyzing vast datasets, AI can uncover patterns in obesity management, improving the effectiveness of Ayurvedic treatments.

3. Results

The integration of AI into Ayurvedic treatment for *Sthoulya* yields numerous benefits:

- **Enhanced Diagnostic Accuracy**: AI analyzes multi-dimensional data, such as genetic, lifestyle, and environmental factors, to determine an individual's Prakriti and root imbalances causing obesity.
- **Personalized Treatment Plans:** AI tailors Ayurvedic interventions like dietary adjustments (*Ahara*), herbal remedies (*Dravyas*), detox therapies (*Shodhana*), and lifestyle modifications (*Vihara*) to meet individual needs.
- **Real-Time Monitoring:** AI-driven health monitoring systems track progress dynamically, enabling timely adjustments to treatment plans for optimal effectiveness
- **Accelerated Research:** AI contributes to the discovery of medicinal herbs and combinations to combat *Sthoulya*. It also predicts herb-drug interactions, enhancing both safety and efficacy
- **Improved Preventive Care:** AI generates preventive care recommendations based on Ayurvedic principles, empowering individuals to make sustainable health choices.

4. Discussion

The integration of AI with Ayurveda presents a transformative approach to managing *sthoulya*, combining ancient wisdom with modern technological advancements. This synergy enables Ayurveda to adapt to contemporary health challenges, such as the global obesity epidemic, while retaining its holistic principles.

AI's ability to process and analyze vast amounts of data aligns perfectly with Ayurveda's personalized treatment philosophy. By examining genomic, lifestyle, and environmental factors, AI facilitates precise identification of *Prakriti* and root causes, tailoring interventions to address obesity's underlying imbalances. This personalized approach enhances the efficacy of Ayurvedic treatments, ensuring targeted and sustainable results.

Moreover, AI-driven real-time monitoring systems revolutionize health care by providing continuous insights into an individual's progress. These systems enable dynamic adjustments to dietary plans, herbal formulations, and lifestyle recommendations, ensuring treatments remain relevant and effective. This proactive approach empowers individuals to take charge of their health, promoting long-term well-being.

Additionally, AI accelerates research in Ayurveda by exploring the properties of medicinal herbs and predicting herb-drug interactions. This not only safeguards traditional knowledge but also fosters innovation, paving the way for advanced therapeutic solutions while respecting Ayurveda's core principles.

Despite its benefits, the integration of AI into Ayurveda faces several challenges. These include standardizing traditional diagnostic tools, addressing ethical concerns regarding data usage, and ensuring collaboration between Ayurvedic practitioners, technologists, and policymakers. Overcoming these hurdles is essential for realizing the full potential of this integration.

Overall, AI's role in Ayurvedic management of *sthoulya* exemplifies the potential of merging tradition with technology. It ensures personalized care, preventive health strategies, and innovative research, offering a promising pathway to tackle obesity holistically and sustainably.

5. Conclusion

The integration of AI with Ayurvedic treatment for *sthoulya* offers a novel and effective approach to managing obesity. By combining AI's analytical and predictive abilities with Ayurveda's time-tested, holistic principles, this synergy allows for highly personalized, preventive, and corrective healthcare solutions. The collaboration of Ayurvedic practitioners, AI technologists, and researchers is crucial to overcome challenges, such as the standardization of traditional diagnostic tools and ethical concerns in AI applications. Ultimately, this fusion ensures Ayurveda's relevance in modern healthcare while preserving its essence. The future promises innovative strides in the management of *Sthoulya*, contributing to global efforts in combating obesity.

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