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Intervention of IT in *Rog Nidan Evum Vikriti Vigyan* - An Explorative Review

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ABSTRACT

Introduction: Going by the trend, the Indian traditional medicine system Ayurveda is observing a paradigm shift in its growth, and in the era of technology AI (Artificial Intelligence) is one of the main factors behind it. Be it the discovery of new medicines, implementation of a new drug discovery model, getting its global acceptance through patents, or the delivery of the final product through AI equipped supply chain model system, the intervention of technology cannot be ruled out. **Methodology:** The literature survey was done through Google Scholar database, PubMed, and Web of Science. The dig out information about the use of IT in Medical fields and, use of technology in Ayurveda were screened for relevant studies synthesis. **Result:** At last, we have sorted out the areas of *Rog-Nidan* that need to be taken care of from a research point of view with the help of information technology. **Discussion:** In this research paper, an effort has been made to review the areas where technology can play its role, especially in *Rog-Nidan*. Additionally, the approaches that are being used in *Ayurveda* where it is being presented as wellness therapy and preventive care have been studied along with identifying the gaps that can be addressed with efficient use of IT-based technologies.

Key words: *Technology in Ayurveda, Rog Nidaan, AI in Ayurveda, IT in Medicine.*

INTRODUCTION

Whether searching for an *Ayurveda* doctor on the internet on the phone or searching about any herb or enhancing patient care or diagnosis, technology has been hand in hand with *Ayurveda* which has been instrumental in the Indian system of medicine for centuries for disease prevention and diagnosis. Based on the Vedic sciences, *Ayurveda* has many disciplines to cure disease which is collectively known as '*Ashtang Ayurveda*'. These *Ashtanga* are known as *Kaaya Chikitsa* (Internal Medicine), *Baal Chikitsa* (Treatment of Children or Pediatrics as per modern medicine), *Graha Chikitsa* (Demonology / Psychology), *Urdhvaanga Chikitsa* (Treatment of disease occurring above the clavicle), *Shalya Chikitsa* (Surgery in any form), *Damstra Chikitsa* (Toxicology), *Jara Chikitsa* (Geriatrics or Rejuvenation) and *Vrsha Chikitsa* (Aphrodisiac therapy).[1]

The knowledge of *Ayurveda* is more than 10 thousand years old, but as time passed, new technology also started being used in *Ayurveda*. There was a change in the knowledge of *Ayurveda* and its applications from the perspective of geographical conditions, Indian philosophy, and Indian knowledge-science, along with this, when other subjects of science progressed, the applications, technology, and equipment derived from them were also used extensively.[2] And due to this *Ayurveda* progressed a lot. Many medicines like *Triphala, Ashwagandha*, etc. are being used for detoxification and their refined forms and the use of many types of technical equipment has increased in research, such as the method developed by the Central *Ayurveda* Research Institute for diagnosing *Ayurvedic* medicines from the blood of patients, which is Blood serum flocculation test is called '*Electrotridoshagram* (ETG)', based on evidence-based principles of

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Ayurveda and based on the principles of *Ayurveda Tridosha*, is a famous instrument of *Nadi Vigyan.*[3] Not only this but the fundamental principles of *Ayurveda* are also being assessed with the help of computer software. Much advanced technology-based equipment like CT scans, CRP D-dimer, etc. are being used in the treatment of patients in many private and public hospitals. At the time of COVID-19, this issue came to the fore in many hospitals when *Ayurvedic* medicines including *Suvarnakalp*, *Swas Chintamani*, and *Sameer Pannak* were used in the treatment of a serious patient, but before its use, all the symptoms were tested with modern technology.[4] For example, to know the level of oxygen saturation level. Unless the disease is accurately identified, proper treatment is impossible. Therefore, the chapter on diagnosis in the old *Ayurveda* texts was very extensive, and only with the help of present-day technology is it possible to accurately identify the disease.[5]

What is *Rog-Nidaan*

It is a branch of *Ayurveda* that guides practitioners to unique ways of examination, diagnosis of ailments, and tailoring treatment plans. *Ayurvedic* practitioners use various diagnostic methods, including:

1. ***Dashavidha Pariksha* (Tenfold Examination):** This includes an evaluation of the patient's pulse, urine, stool, tongue, voice, eyes, skin, touch, overall appearance, and psychological status.
2. ***Ashtavidha Pariksha* (Eightfold Examination):** This includes assessing factors such as *Prakriti* (individual constitution), *Vikriti* (current state of imbalance), *Sara* (tissues), *Samhanana* (body build), *Pramana* (measurements), *Satmya* (compatibility), *Satva* (mental strength), *Ahara Shakti* (digestive capacity) *Vyayam Shakti* (Physical Strength) *Vaya* (specific age group).
3. ***Trividha Pariksha* (Threefold Examination):** This involves examining the patient through observation (*Darshan*), touching or palpation (*Sparshan*), and questioning (*Prashna*).

(1) Problem: To find out why the patient has come to the doctor, the question to ask is - What is the problem? If the patient is conscious then he discusses the painful symptoms, if he is unconscious then the people accompanying him tell him. It is asked how long these symptoms have been present and how they started.[6] Questions about any religious beliefs or preferences, sleeping and eating patterns, eating habits, the patient's social status, diet, income, family concerns and job status, and other questions may also be asked by the physician to help. The three specific methods of diagnosis consist of all the above-mentioned diagnostic methods which the Ayurveda physician may use to know about the patient to identify the probable disease[7] –

a. **Rule-Based Learning: Based on the *Aptopadesha* method of Examination** the system employs a predetermined set of guidelines to analyze the symptoms provided by the doctor. These guidelines rely on the information stored in the system's knowledge base to detect potential illnesses based on the symptoms provided for example *saam- niram dhatu khaya- vriddi lakshan.* The process of deduction relies on logical reasoning and the cause-and-effect connections between symptoms and illnesses.[8]

b. **Knowledge-based Expert Systems: Based on the *Anumana* method of examination,** Expert systems, knowledge-based systems, and developing decisions based on these systems are currently used in *Rog Nidaan.*[9] Expert systems have the following aspects where the information processing is done –

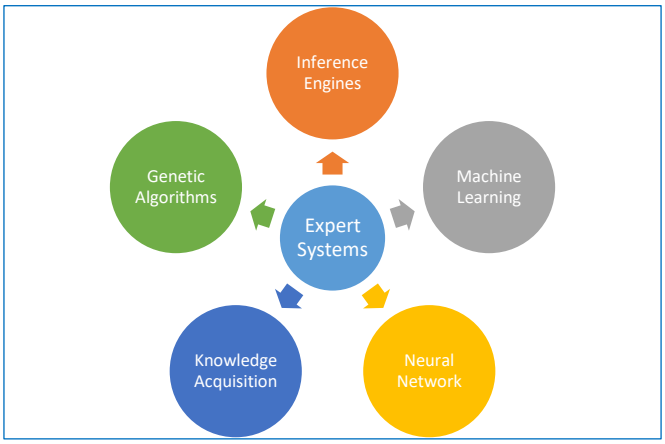

Figure 1: Different Aspects of Expert Systems in the Ayurveda Diagnostic

ISSN: 2456-3110 REVIEW ARTICLE February 2024

(2) Fact collection:

(a) Based on *Pratyaksha* method of examination the method of finding out the exact problem by questioning the patient has been very effectively present in all the texts of Ayurveda. In *Ayurveda*, there is mention of examination of not only the patient but also the messenger who brings his condition.[10]

The questionnaire has three parts:

1. family,
2. personal,
3. questions trying to find out the current suffering.

(b) Physical examination - Department-wise and diseases many applications are being used these days. This is the compilation of medical examinations and techniques employed to gather health data and detect both abnormal and normal states of the human body. Many IT-based applications can be used along with the procedure and tests.[14]

There are three parts of the examination:

(1) Inspection (*Darshan*): As an old proverb says that Ayurveda doctor looks at the peels lying at the door and tells what the patient has eaten means observation of the surroundings is equally important as collecting the facts from the environment. Different digital devices are being used in this category i.e. digital otoscope, digital stethoscope, Tympanic Membrane, Oropharynx, etc.[15]

(2) Tactile examination (*Sparshan*): Facts known through observation are confirmed by touch. It contains knowledge about pain, tactile sensation, swelling, fracture, etc. Many medical devices are being used and more and more are on the list i.e. For Weinstein Enhanced Sensory Test, Hand Monofilaments can be used similarly for Touch-Test Sensory Evaluator, filaments are being used, for Tactile Sensitivity Test, D-shaped monofilaments are used, for pain testing and its deep impression can be estimated wirelessly with the help of wireless algometer device, for measuring the muscle strength, Wireless Static Force Gauge devices are being used.[16]

(3) Asking questions (*Prashna*): Now the method of collecting facts from the patient can be of two types -

1. **Quantitative Data Collection Methods -** In these doctors ask different types of questions and try to establish relationships among them on a mathematical basis, for example, regression, and correlation are the common methods in this method. In the field of healthcare research, researchers globally rely on a variety of tools for data collection. These tools include popular software like Microsoft Excel, Microsoft Access, Google Forms, and SPSS.[11] These tools enable researchers to efficiently collect, organize, and analyze data, ensuring the accuracy and reliability of their findings. By utilizing these technology-driven tools, researchers can streamline the data collection process and enhance their ability to gather valuable insights in the healthcare domain.[12]

Here is the list of data collection tools that can be used by doctors –

a. Athena Health's electronic health records (EHR)

b. Jotform's HIPAA-compliant online form

c. Zoho's health relationship management system

d. Jitterbit Medical Data Collection Forms

e. SnapLogic Form

f. Informatica Form

g. Attunity Data Collection Form

2. **Qualitative Data Collection Methods -** In this method, the doctor collects data by asking questions from the patient in two ways –

a. Interview Method: As of now, the interview process has moved towards video-based interview software as it helps in two ways, first it helps in telematics where one physician can interact with others and second it helps to be connected over a distance virtually.[13]

Here is the list of video interview-based software -

ISSN: 2456-3110 REVIEW ARTICLE February 2024

a. VidCruiter
b. interviewstream
c. Avature
d. Harver
e. Clovers
f. Hireflix
g. SparkHire
h. HireVue
i. myInterview
j. Recright

b. Questionnaire Method: Different questionnaire-making software may be used by Ayurveda physicians individually. Herewith is the list of few software which can be used for making the questionnaire for collecting the data -

a. ProProfs
b. Checkbox
c. Jotform
d. Typeform
e. SurveySparrow
f. Alchemer
g. Qualtrics

All above type of examinations findings recording, visualization on different scales in different devices, storage as a database, analysis, and sharing of digital recordings is also possible with the help of digital devices nowadays which can be easily observed in digital telematics.[18,19]

Furthermore, the examination involves a sequential analysis of bodily systems including the digestive system (comprising the mouth, tongue, throat, stomach, liver, intestines, spleen, and rectum), the cardiovascular system, the respiratory system, the urinary system (encompassing kidneys and bladder), the skin, the nervous system (comprising intelligence, knowledge, muscular efficiency, and sense organs such as dexterity and reflex action), as well as the bones and joints. Presently, numerous image-based methodologies are employed for diagnostic purposes, such as sonography, endoscopy, X-ray CT scans, magnetic resonance imaging (MRI), and nuclear medical imaging. Additionally, methods like ECG, EEG, EMG, and ENG utilize probes placed on the body to measure the electric field, aiding in the detection of underlying issues.[20]

CONCLUSION

The current necessity lies in employing AI-driven visual tools for patient examination. This cutting-edge technology offers unparalleled precision in analyzing components of medical devices. It adeptly identifies even the slightest flaws or deviations from standards. Additionally, it seamlessly generates detailed reports, ensuring traceability and streamlining workflows. Detection of imperfections such as scratches, dents, cracks, misalignments, and other subtle issues, which are challenging to spot with the naked eye, is achievable at a faster pace through the analysis of visual data, enhancing the accuracy and efficiency of quality control checks. This is exclusively feasible with the aid of information technology-based medical devices.

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