STUDY OF THE APPLICATION OF INFORMATION TECHNOLOGY IN THE TREATMENT AND PREPARATION OF MEDICINE IN AYURVEDA WITH SPECIAL REFERENCE TO KERALA

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by

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2005

DECLARATION

This thesis "**Study of the Application of Information Technology in the Treatment and Preparation of Medicine in Ayurveda with special reference to Kerala**" has not formed the basis for the award of any Degree, Diploma, Associateship, Fellowship or other similar Title or recognition before.

University of Calicut,
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CERTIFICATE

This is to certify that this thesis is an authentic record of the bonafide research work carried by Sri. Hemachandran Nair, G. under my supervision and guidance and that neither this thesis nor any part of it has previously formed the basis for the award of any degree or diploma.

University of Calicut,
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INTRODUCTION

Hemachandran Nair. G "Study of the application of information technology in the treatment and preparation of medicine in ayurveda with special reference to Kerala" Thesis. Department of Library & Information Science, University of Calicut, 2005

CHAPTER I

INTRODUCTION

Need and Significance of the Study
Statement of the Problem
Definition of the Terms
Objectives of the Study
Hypotheses
Methodology of the Study
Scope and Limitations of the Study

INTRODUCTION

The Information Technology revolution is being described as the most important development in the history of humankind since the industrial revolution. Characterised as 'The Third Wave' by Alvin Toffler, in 1980, it has the potential to change the ways of man and society beyond the wildest of imaginations. The computer, invented initially to process information, slowly grew into a storehouse of information. It then became sophisticated and ever more powerful and got hooked to others of its kind to form a formidable network. This network further acquired the capability of distributing electronically processed information to all, overcoming every conceivable form of barriers, including geographical and political.

The role of computers in clinical practice and with a growing failure of traditional techniques to deal with the rapidly increasing information management needs of practitioners, it has become obvious that a new and essential topic has emerged for medical and other health professionals (Garibaldi, 1998). The advent of the information super highway expanded the possibilities for information and communication technology in healthcare industry. With continuing advances in information and communication technology, the application of computers in medicine has increased rapidly, and has the potential to revolutionise healthcare (Kapur, 2001). Countries that once were isolated from information that was important to citizens ranging from consumers to scientists to those interested in political issues, are finding new options for bringing timely information to the desktop machines of individuals with an Internet connection. The Internet, with its powerful penetration and scalability, has become an increasingly popular medical information resource. As the Internet users grow, it is not surprising that increasing numbers of

patients, as well as healthy individuals are turning to the Internet for health information.

The goal of integrating medicine and information technology is to provide a mechanism for increasing the sophistication of health professionals, so that they know and understand the available resources to provide better healthcare facilities (Gorman, 1995). One of the major aims of modern medical technology is to reduce costly time spent in the hospitals, while enabling effective diagnosis and treatment to continue in the most human environment possible with the use of computerised devices (Singer, 2000). The escalating tendency to apply information technology to all patient-care tasks is a frequently cited phenomenon in modern medical practice (Fagan and Shortliffe, 2000).

In the present era of competition and globalisation, every branch of science is trying to retain its identity in the globe by reorienting and developing itself according to the needs by conducting various kinds of research. Ayurveda: the traditional healthcare system also is trying to prove its identity by searching newer remedies to overcome the diseases for which there is no answer in modern medical science. With the growing institutionalisation of education in Ayurveda in the present times, need has been felt to launch research and application of information technology in order to update it in terms of its understanding and application to the present day need of the people.

Globalisation, intellectual property rights issues and biopiracy are becoming major problems in the indigenous traditional medical system like Ayurveda. The new world order is posing challenges to the Ayurveda system. Kerala has contributed much to the growth of Ayurveda. Kerala was the first state in India to impart the education of Ayurveda through formal institution in 1889 (Kurup and Vijayakumar, 1999). Kerala has the best Ayurvedic

physicians, firms, and clinics in India. Among the Ayurvedic systems, Kerala Ayurveda has its own special brand equity since this science is still preserved and practised with the highest purity in the state. The rich flora and fauna also contributed to the development of Ayurveda in the state. Apart from the Ayurvedic products, Ayurvedic treatment procedures also have good international healthcare market. The question today is whether Kerala's Ayurvedic sector is equipped to meet the emerging requirements of the world market and reach at global level.

At present Ayurvedic medicines are not cost-effective. Ayurvedic treatment is individual based and drug production is a time consuming process. In order to face the above challenges and make it mass based and cost effective modern technologies have to be introduced. The Ayurvedic medicines cannot be prepared in bulk quantity in a very short time and supplied immediately as in the case of Allopathy medicine. Another important point in Ayurvedic medicine is its way of treatment. Many practitioners still resort to the traditional ways to diagnose the disease (Mathew, 1998). The rules and regulations of this sector are quite old and totally incapable to support the industry in modern developments. Considering all these facts it can be concluded that Ayurveda needs a restructuring in the global context to meet the rising demands of cyber society.

The process of restructuring of Ayurveda for the modernisation, the application of IT is very much required. This complex process of application of IT in the treatment and preparation of Ayurveda medicine needs to be studied in detail with sound theoretical and methodological foundations. However this question of developing theories and methodology poses a great challenge to Ayurvedic practitioners and information technologists at international level. This system, which has proven in India for hundreds of years, has kindled the interest of the entire world and they look at it as an alternative holistic health

care system. This specific area of research remains as an almost virgin field, with a lot of challenges and possibilities. Being a pioneering study it could not rely much on any of the existing models and approaches and there is a need to develop original models and approaches of its own.

1. Need and Significance of the Study

Ayurveda, the holistic health care system, which originated in Ancient India, is gaining more relevance today than ever before. Ayurveda has been recognised as the most user - friendly and environment - friendly system of medicine. More and more people are turning to natural products due to various factors such as limitation and side - effects of modern synthetic medicine. Several experts are of the view that, Ayurveda will become the most effective alternate system of medicine, because of its holistic approach and its basic philosophy of the total well being of the individual and the humanity.

In Kerala the production of Ayurvedic drugs remains stagnant even in the organised sector. Till date the production has not done in well-engineered plants. Most of the mechanised plants are only improvisations of old manual procedures for a higher batch size. The result is high cost of production and difficulty in quality control. Another major threat in the field is the depleting sources of herbs. Even though the state government has put Ayurveda in the priority sector for Kerala's industrial development, it will not serve any purpose for the modernisation and development of the industry (Narayan, 1999). There is an urgent need for modernising Ayurveda to withstand the challenges of time. Otherwise it will only result in the mushrooming of products manufacturing units without adequate facilities for quality production. It will only spoil the sector than developing it. However the Ayurvedic system has basic weakness due to its over emphasis on tradition, its inability to apply modern techniques and technology, scattered Ayurveda texts and diverse

schools of thought and lack of standardisation in the drugs preparation, diagnosis and treatment.

The influence of Ayurveda among the foreign public began after the Alma Ata declaration of WHO in 1980 recognising Ayurveda as an alternative system of medicine (Patel, 2000). It has created a major awareness in the West, particularly in the institutional level. This has expanded the scope of Ayurveda rather than merely being an ancient recipe for illness. In order to promote, propagate, and equip Ayurveda to meet the global needs, there is urgent need to update the ancient knowledge and the system in pace with the development of science and technology. Series of studies, research and developmental activities and applying Information Technology on a massive level on the diverse aspects of Ayurveda are essential in the modern global society. It is expected that the study will generate or evoke greater awareness among the practitioners of the Ayurveda, manufacturers of Ayurvedic drugs and Information Technology experts regarding the possibilities of application of IT in Ayurveda and thereby modernisation of diagnosis and treatment of diseases and preparation of medicine to meet the emerging healthcare needs.

Ayurveda is centuries old system and the most effective alternate system of medicine even in the cyber society. But Ayurveda is not yet equipped to meet the challenges of the cyber society. So there is an urgent need to restructure Ayurveda without deviating from the basic principles, for the emerging cyber society at global level.

Information Technology can very effectively be applied in Ayurveda. Ayurveda is the most suitable system of medicine in which Information Technology can be applied, provided both the IT experts and Ayurveda experts have very clear idea about the potentiality of both the systems. The fear of Ayurvedic practitioners is that if they alter the traditionality, the system will perish. So they are reluctant to apply new technologies in the Ayurvedic

system. To change their mindset, they must realise that Ayurveda has global chance in this century as the most useful alternate system of medicine, and then only the system will grow. So the study is expected to change their mindset and throw some lights on the vast opportunities of Ayurveda. This is the humble beginning of the one among the new and innumerable studies. No one has conducted a similar study like this before. An attempt has been made to integrate information technology and Ayurveda in the present study, is a major step in this regard.

2. Statement of the Problem

The study is entitled as "**Study of the Application of Information Technology in the Treatment and Preparation of Medicine in Ayurveda with special reference to Kerala**"

2.1. Definition of the Terms

2.1.1. Application

According to Chambers 20th Century Dictionary (1983), ' Application' means the act of applying, administering, or using. The dictionary definition holds good in the present study.

2.1.2 Information Technology

UNESCO defined "Information Technology", as scientific, technological and engineering disciplines and management techniques used in information handling and processing, their applications, computers and their interaction with men and machines, and associated with social, economic and cultural matters.

"Information Technology" includes all matters concerned with the furtherance of computer science and technology and with the design,

development, installation, and implementation of information systems and applications (www:ichnet.org, 2001).

In the present study 'Information Technology' means computer and allied technologies used in the diagnosis, treatment of diseases and preparation of medicine in Ayurveda.

2.1.3. Treatment

The word "Treatment" means the application of remedies with the object of affecting a cure, therapy (Reader's Digest Universal Dictionary, 1993). In the present study 'Treatment' means application of remedies by the use of Ayurvedic medicine.

2.1.4. Preparation

The word "Preparation" means the act or process of preparing. The state of being made ready before hand; readiness (Reader's Digest Universal Dictionary, 1993). "Preparation' in the present study means the act of making Ayurvedic medicine.

2.1.5. Medicine

Longman Dictionary of Contemporary English (1978) defines 'Medicine' as a substance used for treating disease. The dictionary definition holds good in the present study.

2.1.6. Ayurveda

Ayurveda is made up of two Sanskrit words: Ayu, which means life and Veda, means the knowledge. According to the ancient Ayurvedic scholar Charaka, "ayu" is comprised of four essential parts: the combination of the mind, body, senses and the soul (Dash and Junius, 1983). In the present study Ayurveda means the traditional system of medicine known by this name.

2.1.7. Kerala

"Kerala" is the most thickly populated South Indian State and bounded North by Karnataka and East and South-East by Tamil Nadu, South-West and West by the Indian Ocean with the area of 38,863 sq. km (Turner, 1998). In the present study 'Kerala' refers to the constituent state of India which is known by this name, where most of the well-known Ayurvedic firms and physicians are now located.

3. Objectives

1. To examine the relevance of Ayurveda as an alternate system of medicine.
2. To asses the present level of application of IT in the treatment of diseases by Ayurveda system.
3. To identify whether there exists any significant difference among different groups of Ayurvedic practitioners in the use of IT in their practice.
4. To explore the extent of modernisation in the preparation of Ayurvedic medicine by the application of IT.
5. To understand whether there exists any significant difference between large/medium and small firms in the application of IT in the manufacture of Ayurvedic medicine.
6. To explore the level of research and development in Ayurveda.
7. To explore the possibilities of IT application in the treatment and manufacture of Ayurvedic medicine.

4. Hypotheses

1. Ayurveda is a highly relevant alternate system of medicine in the modern times.
2. The level of use of IT in the Ayurvedic treatment is poor.
3. There exists significant difference among different groups of Ayurvedic practitioners in the use of IT in their practice.
4. The modernisation in the preparation of medicine by the use of IT in Ayurveda is not extensive.
5. There exists significant difference between large/medium and small firms in the application of IT in the manufacture of Ayurvedic medicine.
6. The level of research and development in Ayurveda is low.
7. There is wide scope for application of IT in the treatment and manufacture of Ayurvedic medicine.

5. Methodology of the Study

A brief description of the methodology of the study is given below.

5.1. Sample used

The sample of the Ayurvedic practitioners and Ayurvedic drug manufacturers are collected from the three regions of the Kerala state. The total sample of the Ayurvedic practitioners selected for the study is 110 and manufacturers is 50.

5.2. Variables

The variables of the study are discussed below.

5.2.1. Variables of Ayurvedic Practitioners

The major variable under study is the application of IT in the diagnosis and treatment by Ayurvedic practitioners.

The following are the classificatory variables.

a) Age

b) Gender

c) Qualification

d) Experience and

e) Specialisation of the practitioners

5.2.2. Variables of the Manufacturers

The major variable under study is the application of IT in the preparation of Ayurvedic medicine.

The size of the manufacturing firms is taken as the classificatory variable.

5.3. Tools Used for Data Collection

The required data were collected using the following tools constructed by the investigator, with the help of the guide.

1. Questionnaire for Ayruvedic Practitioners and
2. Questionnaire for Manufacturers of Ayurvedic Medicine.

5.4. Statistical Techniques used for Analysis

The statistical package SPSS is used to analyse the data to arrive at conclusions and to test the hypotheses. The statistical techniques used are

1. The percentage analysis and
2. The Z-test for significance

6. Scope and Limitations of the Study

There is an ever-increasing global demand for herbal drugs during the last two decades. Though Ayurveda has crossed the national boundaries and the mental barriers to meet the healthcare demands of the world community, the interactions between Ayurveda medicine and Allopathy medicine is essential. For the smooth interactions between them, application of IT in Ayurveda is quite essential. The modern technological aids used for diagnosis and treatment in modern medicine can be used in the Ayurvedic medicine also. Therefore the revalidation and modernisation of Ayurveda is essential through the application of IT and research in both fundamental and applied aspects of Ayurveda. The adoption of information technology in Ayurveda will enhance the interactions between Ayurveda and modern medicine. This study is expected to generate much awareness among Ayurveda practitioners and manufacturers about the need for modernisation of Ayurveda with the application of information technology to meet the challenges of future healthcare needs.

The present study concentrates on Ayurvedic practitioners and manufacturers of drugs. This study is intended to provide a basic methodical and theoretical framework for giving an explanation for the process of application of IT on the treatment and preparation of Ayurvedic medicine. The approach of the study is a multidisciplinary one as it integrates the basic theories of Ayurveda, information science, information technology and cyber medicine.

The published literature in this area is comparatively less. So the interviews with the eminent experts were also undertaken to reach at conclusions. The basic approach of the researcher of the present study is mainly that of the approach of an information scientist rather than that of an Ayurvedic practitioner.

The findings of the study may be useful to administrators and higher education planers at National and State level for formulating correct policies and strategies with regard to the modernisation and application of information technology to meet the rising healthcare needs through the alternative medical systems, especially the system of Ayurveda. This will be useful for library and information systems, network experts and managers in designing and implementing highly efficient library and information system in this field. The study provides a theoretical and practical explanation for the complex process of modernisation and application of IT in the treatment and preparation of medicine in Ayurveda. As it is neither possible nor feasible to conduct the study by taking all the Ayurvedic practitioners and manufacturers, a representative sample of 110 practitioners and 50 manufacturers are taken.

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TRENDS AND DEVELOPMENTS OF AYURVEDA

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CHAPTER II

TRENDS AND DEVELOPMENTS OF AYURVEDA

Origin of Ayurveda
What is Ayurveda
Basic Philosophy of Health, Disease and Treatment in Ayurveda
Ayurveda as a Sastra
Ayurvedic View of Life
Ayurvedic Viewpoint of Structure and Functions of Body
Diagnosis in Ayurveda
Modes of Ayurvedic Treatment
Ayurvedic Medicines
Ayurveda in India through the Ages
Growth of Ayurveda in Kerala
Ayurveda at International Level
International Market Share of Ayurvedic Drugs and Products
Universality of Ayurvedic Treatment
Scope of Ayurveda Medicine
Social Relevance of Ayurveda
Ayurveda in the context of Globalisation
Patents and Intellectual Property Rights in Ayurveda
Biopiracy in Ayurveda
Standardisation of Ayurvedic Drugs
Research in Ayurveda
Information Technology
The Information Society
The Knowledge Society
Cyber Society
Medical Informatics
Cyber Medicine
Information Technology in Ayurveda
Computerised Ayurvedic Studies
Current Problems in Ayurveda

TRENDS AND DEVELOPMENTS OF AYURVEDA

Ayurveda, the ancient science of life and health, is a unique heritage of India. In spite of its glorious past as a global medicare system, presently its official practice is limited only to India and certain neighbouring countries. With the changing concepts of health and disease and shifting scenario of health needs of the present times, there has been an amazing arousal of interest which is likely to be accelerated with the growing trends of information technology, economic globalization and industrial activism.

The present study is basically conducted in the field of information science and Ayurveda. It has several theoretical and practical challenges as nobody has attempted to conduct a study like this before, especially in the context of information society, knowledge society, cyber society, medical informatics, cyber medicine etc. Considering the importance of the above concepts for conducting the present study, this topic of "Trends and Developments of Ayurveda" has been included as a chapter, though this is an integral part of review of literature.

1. Origin of Ayurveda

Ayurveda is an intricate system of healing that originated in India thousands of years ago. The historical evidence of Ayurveda can be seen in the ancient books of wisdom known as the Vedas. In the Rig Veda, over 60 preparations were mentioned that could be used to assist an individual in overcoming various ailments. The Rig Veda was written over 6,000 years ago, but really Ayurveda has been around even longer before. Ayurveda is more than just a medical system. As the name itself implies Ayurveda, is the science of life. One of the principal tenets of Ayurveda is that 'life is eternal', so its

science should also be eternal. According to the Charaka Samhita, Ayurveda is eternal because of following reasons.

1. It has no beginning.
2. It deals with things, which are inherent in nature.
3. Such natural manifestations are eternal.

Based on several facts and proofs, scholars of Ayurveda and ancient literature have said that Ayurveda originated before or around 6000 B.C. because prior to this, Ayurveda was preached and practised orally. Historians have considered this to be the time of origin of Ayurveda, speaking on the basis of written proofs only (Dash and Junius, 1983).

2. What is Ayurveda?

Ayurveda is made up of two Sanskrit words: Ayu which means life and Veda which means the knowledge. To know about life is Ayurveda. However, to comprehend the vast scope of Ayurveda fully, it is necessary to understand the meaning of "Ayu" or life. "Ayurveda' in totality means 'Science of life'. It incorporates all aspects of life whether physical, psychological, spiritual or social. What is beneficial and what is harmful to life, what is happy life and what is sorrowful life; all these four questions and life span allied issues are elaborately and emphatically discussed in Ayurveda. According to the ancient Ayurvedic scholar Charaka, "ayu" is comprised of four essential parts. These are mind, body, senses and the soul (Gupta, 1919).

3. Basic Philosophy of Health, Disease and Treatment in Ayurveda

As per Ayurveda, 'Health' is a state of equilibrium of normal functions of doshas, dhatus, malas and agni with delighted body, mind and soul. It means that when Doshas, Dhatus, Malas and Agni are constantly in a state of functional equilibrium, then the health is maintained. Otherwise distortion of

the equilibrium results into diseases. Erratic lifestyle is believed to be one of the basic reasons behind the failure of the mechanism of maintaining equilibrium (Dash, 1980). Treatment either with or without drugs and application of specific rules of diet, activity and mental status as described, disease wise, brings back the state of equilibrium i.e. health.

4. Ayurveda as a Sastra

The word philosophy is used in the sense of the Sanskrit word *darsana*. The term *sastra* is translated as science. Darsana can be understood as appraisals of the fundamental laws of nature. There can be different *darsanas*, because of the different premises from which and through which the enquiry proceeds. Sastra is the study of how the fundamental principles of nature are put into practice with regard to some particular aspect of life. What, why, when and how to apply are explained in the sastra. Ayurveda is *ayussastra:* the science of life. Life is what living beings feel, think, say and do all the time. These external conditions and circumstances affect the physical and mental manifestations. If all these external factors are in proper order, the internal biological processes are also in proper order resulting in health, experienced as all –round –well –being, or ease. Otherwise it is disease, disorder, with its various aspects. They are explained in the texts of Charaka, Susruta and Vagbhata. These are the fundamental sources of valid knowledge of Ayurveda or aptavakya. Only through the correct interpretation of the texts, can these ideas be understood properly. Here *darsanas* assist in correctly assessing the importance of the texts. One may think that in the evolution of various darsanas, Ayurvedic speculations may have made some contributions; because, in the process of solving certain problems in Ayurveda, the ideas of the *darsana* naturally come up. Perhaps Ayurveda provided the contexts to prove the validity of the darsanas (Thirumulpad, 1999).

5. Ayurvedic View of Life

Ayurveda perceives man as an integral part of nature. They both have fundamental commonalities. Every anguish and distress of man is caused by his ignorance of the body and the mind. It is this anguish, which manifests as a disease. Appropriate and perfect knowledge retrieves man from his anguishes. Ayurveda attempts to understand and explain the human life in its entirety. It may not be completely true to characterise Ayurveda just as a science dealing with the human body and its life. Because, it is more than a healthcare system, it happens to be a philosophy of life (Varier and Regunath, 2001).

6. Ayurvedic Viewpoint of Structure and Functions of Body

Universe as well as human body is made up of five basic elements collectively called 'Panch Mahabhootas'. These are Aakash (Ether), Vayu (Air), Agni(Fire), Aapa (Water) and Prithvi (Earth). The sixth mandatory component of life is Atma (life spirit) without which life ceases. The human body is made up of Doshas (Bio-humours), Dhatus (Body matrix) and Malas (excretable products). Vata, Pitta and kapha known as the Tridoshas are physiological entities of the body, which are responsible for carrying out all the functions of the body. Dhatus are the structural entities of the body. These are Rasa (Plasma), Rakta (Blood cells), Mamsa (Muscular tissue), Meda (Fatty tissue), Asthi (Bony tissue), Majja (Bone marrow) and Shukra (Hormonal and other secretions of genital). Agni (Metabolic fire) is in thirteen different forms and carries out the whole metabolism of the body. The waste products of the body, which are excretable, are produced in the body as by-products of metabolism. These are known as malas, which include Pureesh (faeces), Sweda (sweat) and Mutra (urine). All biotransformations within the body occur through Srotases (body channels), which are the sites for the action of agni (Sharma, 1995).

7. Diagnosis in Ayurveda

Diagnostic procedures in Ayurveda are two pronged; one is aimed to establish the state and type of pathology and second to decide the mode of treatment to be applied. The former implies examination of the patient and the different investigations to diagnose the disease entity. Inspection, palpation, percussion and interrogation are the main modes of physical examination. The second type of examination is to assess the strength and physical status of the individual so that accordingly the type of management required could be planned. For this examination of Prakriti (Body constitution), Saar (Tissue quality), Samhnan (physique), Satva (Mental strength), Satamya (specific adaptability), Aaharshakti (diet intake capacity), Vyayaam shakti (exercise capacity) and Vaya (age) is done. On the basis of this examination the individual is decided to be having Pravar Bal (excellent strength), Madhyam Bal (moderate strength) or Heen Bal (low strength) (Kurup, 1983).

8. Modes of Ayurvedic Treatment

There exists eight divisions of Ayurvedic therapeutics, namely Kayachikitsa (Internal medicine), Shalya (Surgery), Shalkya (Otorhinolaryngology and Ophthalmology), Kaumr Bhritya (Paediatrics, Gynaecology and Obstetrics) Agad tantra (Toxicology), Rasayana (Gerentorology), Vajikaran (Aphrodisiacs) and Bhoot Vidya (Psychiatry) (India, 2000).

The principles of treatment are Shodhan (purificatory), Shaman (palliative and conservative), Nidan parivarjan (avoidance of causative and precipitating factors of disease) and Pathya Vyavastha (do's and don'ts regarding diets lifestyle). Shodhan therapy includes Vamana (medically induced emesis), Virechana (medically induced laxation), Vasti (medicated enema), shirovirechana (administration of medicines through nose) and Raktmokshan (Blood letting). These therapeutic procedures are collectively

known as Panch karma. Before executing Panch karma treatment Snehan (olation) and Swedan (getting perspiration) are to be employed first.

9. Ayurvedic Medicines

Whatever is natural, whether belonging to plants, animals, or minerals, is considered the source of raw material for Ayurvedic medicines. However 600 medicinal plant products, 52 minerals and 50 animal products are commonly used.

Ayurvedic medicines are marketed in various forms. The main ones are tablets, pills, powders, fermentation products (Asva-arishta), decoctions, medicated fats (Ghrita and Tel). For topical use drops, creams, lotions, liniments and ointments are available. Dried plant extracts in capsule form are also in use presently (Sharma, 1987).

10. Ayurveda in India through the Ages

Ayurveda is not a stagnant science. It was developing throughout its history, even though there were periods of rapid progress and comparative stagnation. Throughout the history, its propagation was mainly through academic tradition even though familial tradition also co existed. Ayurveda has interacted with various medical systems from time to time and this interaction has also facilitated its growth.

Harappa, Indus Valley Civilization, which arose around 3000 B.C. and lasted for perhaps 1500 years, gave way to the Vedic civilisation. The Aryans brought with them Vedas, their ancient book of wisdom and sacrificial ritual. The Vedas took on their current form at some point during the second millennium B.C. (Svoboda, 1992). Ayurveda is the Upveda or accessory Veda, to the Atharva- Veda. The Atharva – Veda differs in subject matter from the other three Vedas (the Rig-Veda, Yajur-Veda and Sama -Veda), being basically a manual of magic. Both Atharva - Veda and Rig - Veda contain a lot of

reference about drugs, anatomical terms, names of diseases, surgical procedures and therapeutics measures. From the youngest of the Vedas, the Atharva Veda developed Ayurveda. At the turn of the first millennium B.C. the treatise now known as the Charaka Samhita, the first and still most important of all Ayurveda texts appeared (Agnivesh, 2002).

Ayurveda gained its identity as a separate science in the post Vedic period. During this period the major Ayurvedic treatise known as Samhita was written (Samhita is a compendium). During the Samhita period scientific conceptualisation of popular knowledge and formation of scientific medicine was coined. Samhita period was followed by Sangraha period. Sangraha is a compilation. This period produced a good number of classics and commentaries of former work. Sangraha period also produced various Ayurvedic dictionaries and Pharmacopoeias. Indian culture entered its golden age during this period and learning flourished. By the sixth century B.C. a University was established at Takshashila in Rawalpindi. One of the Takshashila products was Jivaka, the royal physician of King Bimbisara of Magadha, who was appointed by the King to personally supervise the health of Gautama Buddha and his followers (Agnivesh, 2002).

Ayurveda medicine was already extensively developed by the time of Buddha. The Buddha, who taught compassion for all beings, supported both the study and practice of the medicine. In the third century B.C. Asoka, the emperor of most of North India became a convert to Buddhism. Motivated by compassion for all sentient beings, Asoka built charitable hospitals for both humans and animals throughout his realm (Svoboda, 1992). In the fourth century A.D. three more famous Ayurvedic texts appeared. Astanga Sangraha probably in the sixth century and Astanga Hrydaya about a century later are both ascribed to Vaghbhata. In the eighth century Madhava Nidana, a treatise on diagnostics appeared. The Buddhists, who supported all forms of learning,

set up the most famous university Nalanda, to teach Buddhism as well as Ayurvedic medicine along with other subjects.

The Golden age ended when Mughals invaded Northern India between the tenth and twelfth centuries. At that time Buddhism had developed in entire Northern India and monks went to neighbouring countries like Nepal, Sri Lanka and Tibet where Ayurveda had first penetrated along with Buddhism. The arrival of Mughals brought their own medicine, the Unani Tibbia, to India. While India's Muslim rulers tendered to support Unani, Ayurveda also flourished. During the sixteenth century Akbar, the greatest Mughal emperor and a remarkable enlightened ruler, personally ordered the compilation of all Indian medical knowledge under the direction of his finance minister Raja Todar Mal (Svoboda, 1992).

During the colonial period Lord McCauley ordered that English Medicine should be exclusively encouraged in all areas governed by the East India Company, and the Eastern Systems were actively discouraged. During the 19th century Indian political climate was boiling with the National movement. The interest in Indian art and science was reawakened and Ayurveda began a gradual renaissance. Today it is one of the six medical systems in India that are officially recognised by the government. The others are Allopathy, Homeopathy, Naturopathy, Unani, Siddha, Yoga Therapy and Amchi system of medicine (Svoboda, 1992).

The Independence of India had its impact on Ayurveda too. Ayurveda was hailed as Indian Medicine and government encouraged its growth. A large number of Ayurveda colleges, hospitals and dispensaries were established. Modern anatomy and physiology and surgery were incorporated in the books written during in this period (Agnivesh, 2002).

India's independence had marked the emergence of new legislation and new government policies. A large number of commissions were appointed to

assess the status of Ayurvedic practice and education. The central government has also constituted Central Council for Research in Ayurveda and Siddha. The council has about a hundred units conducting Ayurvedic research. Ayurveda departments were set up under the central and state governments. Governments started Ayurveda University and colleges, and allotted financial grants to Ayurveda colleges in private sector also. Manufacture and sale of Ayurvedic drugs also brought under law. About eighty percent of Indian population utilise Ayurveda for their medical care. In independent India Ayurveda practice gradually shifted from one institution to a more complex multi-faculty institutions.

11. Growth of Ayurveda in Kerala

Kerala has always been a promising land for different social community groups. Kerala is generally hailed as the region of healthy people and health care practice. This is not only due to their social habits and living practices but also due to traditional systems of treatment developed and followed by the people over centuries (Kurup and Vijaykumar, 1999). Kerala has different traditions of Ayurveda schools, efficient practitioners, reputed drug manufacturers and people who have faith in this ancient system. Keralites have greatly contributed to the evolution of proper health care and medical system in their homeland by incorporating several indigenous practices. Kerala has contributed much to the growth of Ayurveda.

Ayurveda has deep rooted and wide spread influence on Kerala. This pan Indian system entered this region through two major streams viz. Buddhistic and Brahmanical. The genesis of Ayurveda can be traced to the Veda, which emerged in the Sapta Sindhu region; its perfect existence can be seen even now in Kerala. It was in the period of Samhita that the medicines and its methods prescribed were put into letters. There arose a number of Samhitas like Carakasamhita and Susrutasamhita. Another great text in the

field was written by Vagbhata viz. Astangahrdayam in seventh century A.D. at Alappuzha. Even though Charaka and Susrutha are revered and their texts are popular in Kerala, it is Vagbhata's Astangahrdayam, which serves as the foundation of Ayurvedic treatment in Kerala (Varier, 1993).

When the Bhramins came to Kerala, they never tried to replace the existing system fully or to impose their system in total. There are Namboothiri Brahmin families called Astavaidyan viz. Pulamanthol, Alathiyur, Kuttancherry, Trissur Thaikad, Eledath Thaikad, and Cirattamon etc. The tradition of Astavaidyas is noteworthy. They are so called because of their proficiency in all the eighth angas. Kerala, which imbibed the pan- Indian Ayurveda, contributed its own share to this branch of knowledge (Varier, 1993).

Kerala has produced a number of works on Ayurveda in Malayalam. Aitihyamala, a collection of popular legends on Malayalam contains many stories on the rare medical skill of various Astavaidyas. Kalari, the martial art of Kerala is a complimentary part of ancient medicine. The masters of Kalari have many drug formulations of their own. There are many medicated oils and peyas also (Murali, 2002).

During the seventeenth century the Dutch Governor of Cochin Hendrik Adrian Van Reed collected and codified the details of Ayurvedic and folk medicinal properties and published Hortus Indicus Marabaricus, the famous ancient materia medica in Latin language. This voluminous study deals in detail with the medical plants of Kerala and identification of plants through 794 illustrations (Sankaran, 2002).

The colonial challenges faced by the Indian society led to the movement during the nineteenth century, which later worked as a catalyst in the propagation of oriental studies. Uppottu Kannan (1825-1885) was a famous Ayurveda Physician from North Kerala. Tayyil Kumaran Krishan (1856 - 1917) had prepared an Ayurvedic Oushadhi Nighantu (Ayurvedic Medical Dictionary)

in Malayalam after fifteen years of hard work in 1906. Which has got good acceptance from Ayurvedists. Vaikkathu Pachu Muthatu (1813-1882) was a versatile genius in Ayurveda treatment and has written two books Hrdyapriya and Sukhasaadhakam based on Astangahrdyayam, which serves as handbook for clinical practice. Colayil Kunji Mami Vaidayn (1865-1933), born in the family of traditional physicians, became a famous physician in a short period (Murali, 2002).

Two most outstanding social reformers in Kerala were Chattambi Swamikal (1854- 1924) and Sri Narayana Guru (1856-1928). Chattambi Swamikal was an expert in Sidhavaidyam, which emphasised treatment by minerals. Sri Narayana Guru was born in the family of traditional physicians and had deep knowledge of traditional medicines (Kurup and Vijaykumar, 1999).

The first and foremost attempt to establish an institution for Ayurvedic studies was started by Kaviyoor Parameswaran Moosad in 1886 at Thiruvananthapuram. In Malabar region a well-known organisation under the name Arya Vaidya Samajam came into existence in 1902. This registered organisation had been patronised by great personalities like Vallathol, the poet, Punnasseri Neelakanta Sharma, the scholar and educationalist and Valiya Raja of Nilambur royal family. Later this organisation was taken up by Vaidyaratnam P.S Varier (1869-1944) who started a centre for Ayurvedic studies at Calicut in 1917(Kurup and Vijayakumar 1999). This study centre is transplanted to Kottakkal, where he started Kottakkal Arya Vaidya Sala in Malappuram in 1902 to make available ready - made Ayurvedic medicines. This institution is now a full-fledged modern Ayurveda college with postgraduate courses and attracts patients from all over the world; the centre has mechanised the production of medicine by using steam and electricity.

After independence the government of Kerala followed a policy patronising traditional medical systems. The government started Ayurveda colleges, and hospitals in a number of villages of Kerala (India, 2000). To ensure the smooth supply of medicine, the government of Kerala started an Ayurvedic drug production centre viz. Oushadhi at Trichur in central Kerala.

11.1. Ayurveda Medical Care Facilities in Kerala

According the annual report of the Indian System of Medicine and Homeopathy in India in the year 2000, there are 116 Ayurveda hospitals and 716 dispensaries in Kerala. The total bed strength in Kerala is 2644. There are 14,000 registered Ayurvedic practitioners and 900 drug production firms in Kerala.

Table 1

Ayurvedic Medical Care Facilities in Kerala

Facilities	Total
Hospitals	116
Dispensaries	716
Bed Strength	2644
Practitioners	14000
Manufacturers	900

11.2. Traditional Practitioners of Kerala

Traditional medicine is the traditional practice of medicine passed from one generation to another. Traditional practitioners are non- institutionally qualified practitioners, who have only a general practical knowledge which is handed down from generation to generation. Traditional practitioners are called "Vaidyans". Vaidya community, is a community whose traditional

occupation is the practice of traditional medicine or Ayurveda. Traditional practitioners are not oriented by academically qualified Ayurvedic practitioners. They gained this knowledge either by their family traditions or by working as assistants or apprentices to the traditional Vaidya for a period of 10 to 15 years or more. They gained a practising experience without academic base and only with a little knowledge regarding the human anatomy, physiology and modern laboratory investigation techniques. At present Kerala has about 6169 non-institutionally qualified Ayurvedic practitioners. They are 44 percent among the total practitioners in the state (Reeja, 2000).

11.3. Market share of Ayurvedic Drugs in Kerala

In Kerala the total value of production of Ayurvedic products has been remaining stagnant around at Rupees. 350 crores for the last few years. Out of this 75 percent was in the organised sector i.e. in the form of trusts, private or public limited companies. The balance is produced and used by the local Ayurvedic physicians in their clinics as a household industry with a licence from the state drug controller (Narayan, 1999). In the organised sector also the production has not done in well-engineered plants. Most of the mechanised plants are only improvisation of old manual procedures for a higher batch size. The result is high cost of production and difficulty in quality control.

In Kerala there are 55 percent people resort to Ayurvedic medicine for treatment. The total annual domestic market of India on Ayurvedic drugs and products are about Rupees. 5,000 crores. The annual domestic market of Ayurvedic drugs in Kerala is Rupees 250 crores. India's export of Ayurvedic medicine was worth Rupees 1125 crores in 2001-2002 with Kerala's export share of Rupees 100 crores (Sharma, 2003).

12. Ayurveda at International Level

Unlike in India, the majority of the foreign government agencies have shown less concern in introducing Ayurveda in their country. The Alma Ata declaration of WHO in 1980, which recognized Ayurveda as an alternate holistic system of medicine has created major awareness in the West. This has expanded the scope of Ayurveda' s official entry into Europe and America.

12.1. Ayurveda in America

Interest of Ayurveda in the United States began in the 1970's, largely as the result of the efforts by the Maharishi Mahesh Yogi Organisation of Transcendental Meditation. In the 1980's Dr. Deepak Chopra wrote introductory book on Ayurveda for the general public and many Westerners became familiar with India's ancient healing science. In addition to this pioneers like Dr. David Frawely of American Institute for Vedic Studies, New Mexico and Robert Svoboda, a Westerner who completed India's BAMS programme of Ayurvedic Institute in New Mexico, have been influential in helping Ayurveda grow in the 1980's (Halperns, (2000). As interest and awareness have grown, training programs of various degrees have emerged. In 1995 the California College of Ayurveda opened its doors. It was the first government-approved institution offering a recognised vocational program in America. At present there are a large number of Ayurveda study programs run by the Florida Vedic College, the International Ayurvedic Institute in Massachusetts and the Ayurvedic Holistic Center in New York. In 2000 two independent representative organisations like California Association of Ayurvedic Medicine and National Association of Ayurvedic medicine were formed. Both organisations have their mission to formalise Ayurvedic educational standards, attaining licensing and setting standards of practice. Opportunities are growing for Ayurvedic physicians from India to practise in

the United States. India's export of Ayurveda drugs to U S in the year 2001-2002 was $ 40.41 millions (Mishra, 2003).

12.2. Ayurveda in Canada

Ayurveda reached in Canada in 1972 by the efforts of Maharshi Mahesh Yogi Organisation of Transcendental Meditation. It has grown on par with the United States. There are a number of Ayurvedic practitioners in Canada. The Canadian Association of Ayurvedic Medicine, Ontario provides training in Ayurveda for physicians and general public and the Maharshi Ayurveda Centre, Ontario also provides health care education according to Ayurveda principle.

12.3. Ayurveda in Europe

Many European countries have increasingly turned towards Ayurveda and natural health foods supplements in the last decade of 20th century. People in Europe are turning towards Ayurveda because there are several grey areas in Allopathy medicine, which are merely suppressing the problem. The herbal medicine market in 2002 was $36.80 millions in the European Union countries.

12.3.1. United Kingdom

In the majority of the European countries, the private sectors have taken great deal of interests in promotion of Ayurveda hoping accreditation with the respective government bodies. The British Ayurvedic Medical Council which incorporates the British Association of Accredited Ayurvedic Physicians (BAAAP) is the only member of the Working Group which is actively encouraging the growth of Ayurveda in Britain. Once the self-regulation comes into force there are opportunities for Ayurveda to be offered in the mainstream publicly funded health care system (Warrier, 2003). There are more than one hundred qualified Ayurvedic physicians in the UK who are registered with the Ayurvedic Medical Association, UK.

12.3.2. Russia

The knowledge of Ayurveda reached at the medical community of Russia in 1966; the "first International Conference on fundamental principles of Ayurveda: Diagnosis and Treatment" had been convened in Moscow with the participation of Kottakkal Arya Vaidya Sala's leading specialists. The proceedings of the conference made quite an impact in Russia's academic circles (Rzhanitsyna, 2000). Russia now has keen interests in institutional collaborations for Ayurveda education and therapeutics resources. With the co-operation in the field of Ayurveda in July 1999 for the first time it has become the subject matter of an agreement signed between the governments of Russia and India. It was the first document that India has signed with another country in regards to traditional medicine. It was a historical landmark in introduction of Ayurveda in Russia's healthcare system. Now Russia is all set to establish all round co-operation with Indian specialists in the field of Ayurveda and train their doctors in Ayurvedic system to promote its growth in Russia (Patel, 2000).

12.3.3. Italy

Ayurveda reached in Italy in the early nineteen nineties. The institute of Italiano di Ayurveda at Firenze established in 1994 provides training, education and clinical practice of Ayurveda. The International Association of Ayurveda and Naturopathy in Italy organises various programs on Ayurveda including short-term courses. India's Ayurveda products export to Italy was worth rupees 7.5 million in the year 2001-2002.

12.3.4. Switzerland

Ayurveda Research Company, Walzenhausen, Switzerland provides Keralia Panchakarma treatment and health care education. There are more than 50 Ayurveda clinics in Zurich. India's export of Ayurvedic, medicines for

therapeutic prophylactic uses to Switzerland is worth rupees 5.6 million during the year 2001-2002 (Gupta, 2003).

12.3.5. Germany

In Germany Ayurveda based health food supplement formulations are sold for millions of dollars every year. There is tremendous market for Ayurveda products in Germany. It has increasingly turned towards natural health foods and food supplements and that is why Ayurveda is increasingly becoming the most favoured health food. Many Doctors in Germany are interested to learn Ayurveda. Germany accounts for 5 billion worth of herbal extracts sold as prescription drugs and covered by national health insurance. India's export to Ayurveda products to Germany was worth 8.04 million dollars in 2001- 2002. But it was 3.12 million dollars in 2000- 2001 showing a tremendous 157.7 per cent growth rate (Sharma, 2003). The major Ayurvedic Centre in Germany is Indo-German Centre for Health and Education and Seva Academy for Ayurveda in Munich (Mathew, 2002). In Germany different types of Ayurveda course are being conducted by various institutes, which are affiliated to Indian Institute of Ayurveda, Pune (Ranade, 2003).

12.3.6. Netherlands

In Netherlands the major Ayurvedic centre is European Institute for Scientific Research in Ayurveda which conducts research in Ayurveda medicine and its clinical effects to various diseases like Parkinson disease, Leukaemia, Cancer and AIDS.

12.4. Australia

Australia is a multicultural country where the streams of many different traditions meet. Medicinal traditions are no exception. In 1979 the first International Congress of Traditional Asian Medicine was held at the Australian National University in Canberra. Ayurveda was practically

unknown in Australia before this event. In 1982 the Australian School of Ayurveda was founded, which is the first registered School of Ayurveda in Australia. In 1981 the Australerba laboratories, a distinguished licensed company manufacturing herbal products for Australia was founded. The Australina School of Ayurveda conducts short information courses of Ayurveda. In 1988, the first Ayurvedic Associations in Australia, the Australasian Association of Ayurveda was founded to bring greater awareness of Ayurveda to the public, to set, and to maintain good standard of Ayurvedic practice. In 1994 the Australian School of Ayurveda together with other Naturopaths established the Australasian Academy of Natural Medicine in Ayurveda (Krishna Kumar and Junius, 2000).

12.5. Ayurveda in Asian Countries

In the third century B.C. Asoka, the emperor of most of the North India became a convert to Buddhism. For the propagation of Buddhism he sent missionaries to many neighboring countries. These emissaries carried Indian science with them, which probably how Ayurveda reached in Sri Lanka, Nepal, Thailand, Myanmar and other Asian countries (Svoboda, 1992).

12.5.1. Nepal

Nepal has a special place in the history of Ayurveda. It is thought by many that the original knowledge of Ayurveda was obtained in the Himalayan foothills of Nepal. There are thousands of ancient Ayurvedic manuscripts located here. In addition, the biodiversity of Nepal makes it a fertile region for many Ayurvedic herbs. Nepal is rich in Ayurvedic tradition. Besides the living tradition its National Archives has many Ayurvedic manuscripts, which are only available here and are yet to be published. Many western scholars and agencies are coming to Nepal to record first hand heritage of Ayurveda, and Ayurvedists of Nepal are having more western patients (Baral, 1996).

The Department of Ayurveda, the apex body for Ayurveda in the country, directly under the Ministry of Health, is responsible for formulation, implementation and overall supervision of Ayurveda hospitals. The Naradevi Ayurveda hospital, a national college of Ayurvedic medicine in Kathmandu, affiliated to Tribhuvan University, conducts Ayurvedic graduate courses of 5 years duration and Ayurvedic certificate course of three years duration. There are Ayurveda regional hospitals, district Ayurvedic hospitals and primary dispensaries in Nepal (Sushila, 1997). More than 150 Indian Ayurvedic drug companies are currently supplying Ayurvedic medicines to Nepal. India's export of Ayurvedic products to Nepal was worth rupees. 20.3 crores in the year 2001-2002 (Alms Ali, 1999).

12.5.2. Sri Lanka

Ayurveda reached Sri Lanka along with Buddhist missionaries in the third century B.C. The Ayurveda now existing in Sri Lanka is almost identical with that in India. The basic ideas of Ayurvedic theory are closely associated with the cultural traditions of both Buddhist, and Hindus in Sri Lanka (Dissanyake, 2003). There are government Ayurvedic hospitals located in almost all districts. Ayurveda is currently practised in Sri Lanka with great success. Several Ayurvedic hospitals, both state run and private, have been opened up in different parts of the island. Ayurvedic physicians are practising in almost all parts of the country. The formation of a National Health Policy for the Ayurveda reflects as a highly developmental activity at present (Abeysekera, 2000).

12.5.3. Bangladesh

The Practice of Ayurveda in Bangladesh was as old as in India, because formerly it was part of India. There are five Ayurvedic colleges in Bangladesh conducting 4-year diploma course. There are a large numbers of Ayurvedic hospitals in Bangladesh. Several Ayurvedic manufacturing units from India are

exporting Ayurvedic medicines to Bangladesh. India's export of Ayurvedic drugs to Bangladesh was for 61 million rupees in 2001-2002(Sharma, 2003).

12.5.4. Myanmar

An Ayurvedic College was started in Myanmar in 1976, which was renamed as college of Burmese Traditional Medicine. However, Ayurveda is the main subject of this course. It is a 3-year diploma course with one year compulsory internship. The Government of Myanmar has decided to upgrade this into a degree course.

12.5.5. Thailand

One Ayurvedic College is functioning in the suburbs of Bangkok. This was started in the private sector with a 4-year course. Graduates of these colleges are appointed in primary health centres of Thailand.

12.5.6. Japan

The Institute of Traditional Oriental Medicine, Tokyo conduct short term Ayurvedic Course for health professionals.

The other Asian countries where Ayurveda is prevalent are Hong Kong, Malaysia, Singapore, Indonesia, Pakistan, Taiwan etc. At present India exports Ayurveda drugs to more than 35 Asian countries (Sharma, 2003).

13. International Market Share of Ayurvedic Drugs and Products

There is a quantum jump of Indian Ayurvedic medicines, plants and products in international market during the couple of years, which shows a tremendous growth rate.

13.1. India's Major Exporting Destinations of Ayurvedic Drugs

Table 2

India's Major Exporting Destinations of Ayurvedic Drugs

Importing Country	2000-2001 (US $ Million)	2001- 2002 (US $ Million)	Growth (%)
America	24.69	40.41	63.67
Europe	21.85	36.80	68.42
Africa	5.25	6.41	22.10
Rest of the World	77.72	126.94	63.33

The exporting of Ayurvedic drugs and its formulations are increasing every year. From Table 2, it can be seen that the annual export of the Ayurvedic products in the two years increased more than 50 percent in Europe and America. The export of Ayurvedic products to America in the years 2000- to 2001 and 2001- 2002 was worth $ 24.69 millions and $ 40.41 millions respectively, which shows the growth rate of 63.67 percent. The export to Europe in the same period was worth $ 21.85 and $ 36.80 millions respectively with a growth rate of 68.42 percent. The export to Africa in the years 2000- 2001 and 2001 – 2002 was worth $ 5.25 and $ 6.41 respectively with a growth rate of 22.10 percent. The export of Ayurvedic products to the rest of the world in the years 2000-2001 to 2001- 2002 was $ 77.72 millions and $126.94 millions respectively. The growth rate shows 63.33 percent increase in the exporting. Therefore the demand for Ayurvedic drugs and its export will increase in the coming years tremendously (Sharma, 2003). The growth of Ayurvedic drugs export is graphically represented in figure 1.

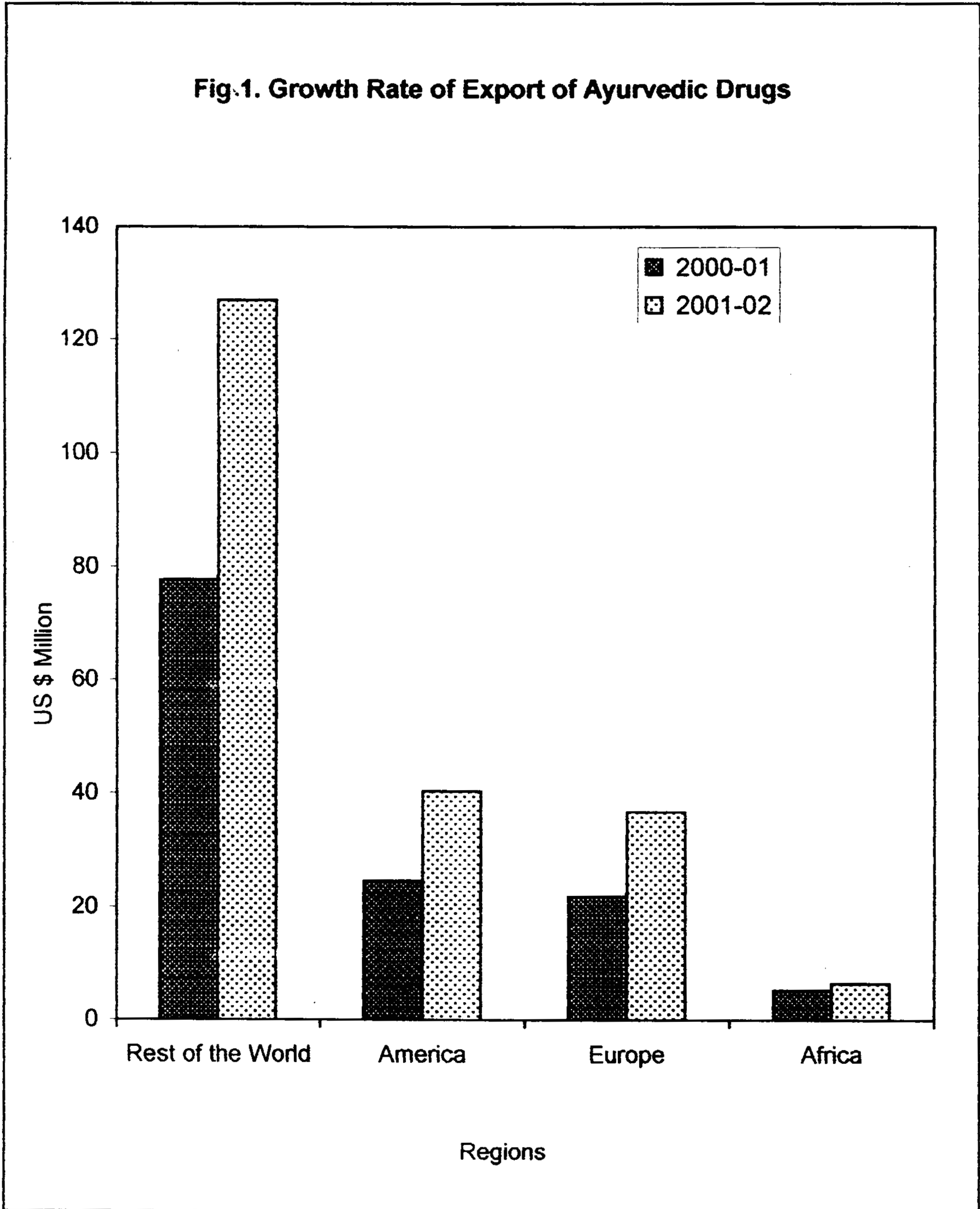
Fig.1. Growth Rate of Export of Ayurvedic Drugs
140
120
100
80
60
40
20
0
US $ Million
2000-01
2001-02
Rest of the World
America
Europe
Africa
Regions

13.2. Domestic Market in India

There are more than 9000 manufacturing units of Ayurvedic Medicines in India. About 50 are large scale, 200 medium scale and remaining are of small scale. Total annual domestic market of Ayurveda drugs and products in India was about Rupees 5,000 crores in the year 2001-2002 (Sharma, 2003).

14. Universality of Ayurvedic Treatment

Ayurvedic treatment is defined as the cure or relief from disease, the removal of its cause. It is the beneficial usage of medicine, diet and practices prescribed separately or together. According to Ayurveda, everything in this universe can be used as medicine and there is not a single plant or any other material that is considered useless from medicinal point of view. The physicians can however, use many drugs for the treatment of various diseases. Ayurveda has its unique method of identifying a disease and describing its diagnosis as well as treatment. The utility of Ayurvedic treatment is not confined to a particular period, region and culture. A medicinal plant described in Ayurveda may grow in a particular area, a particular type of diet prescribed in Ayurveda may be commonly used in a particular region and a type of ritual prescribed in Ayurvedic texts may be prevalent during a particular period of history. But the principles of Ayurveda, especially those laid down to describe drug composition and drug action are universal in nature. It has its unique concepts of physiology and pathology, which are equally applicable to all people in this world irrespective of their geographical, cultural, religious and traditional differences.

Ayurveda is now a dominating system of medicine in India. It is one among the accepted systems of medicine and is becoming more and more popular, due to some of its unique features, viz. emphasising the preventive aspects, treating man as a whole in a psychosomatic approach. Taking into

account the basic constitution of an individual, while diagnosing and treating him having fewer side effects and acting in accordance with the customs and traditions of the people. This uniqueness is essentially based on the fact that Ayurveda is not only medicine but also a guide to a healthy and happy way of living covering aspects of religion, philosophy, and hygiene as well as the treatment of ill health. The chief objective of the Ayurveda is the maintenance of the metabolic equilibrium of man and the restoration of the same if it is disturbed by undesirable factors (Sharma, 1995).

Ayurveda is deeply rooted in Indian philosophy. The founders of Ayurveda have an integrated view of man and life in the universe. It is mainly the Sankhya School of philosophy from which Ayurveda has drawn its understanding of the evolution of the universe and the man. The prime goal of Ayurveda is the maintenance of health and not the cure of disease. Today's understanding of Ayurveda as a system of medicine is due to modern civilisation with very external changes and influences. Besides aiming a healthy life, Ayurveda is also aiming a life useful for others and the human society at large (Bhaskar, 1971).

Modern medical science is currently in the throes of a revolution, which is likely to have a dramatic impact on both the theories of medicine and the way it is practised. The mechanistic model which served biomedicine well for many years is gradually collapsing (Warner, 1997). Another participant in this exciting climate of change and ferment is Ayurveda, India's ancient medical system. While Ayurveda has already contributed much to modern medicine that is reserpine, gugulipid, plastic surgery etc, its real contributions are yet to be made to maintain a healthy state (Nadkarni, 1978).

15. Scope of Ayurvedic Medicine

Ayurveda has a wide scope as far as the prevention of disease, promotion of health and its preservation are concerned. Lifestyle rules

mentioned in Ayurveda texts if applied rigorously would give definite results. Lifestyle related diseases; drug abuse, degenerative diseases, autoimmune diseases and certain metabolic and allergic disorders are well manageable with Ayurvedic techniques and medicaments. Being holistic and disease eradicative with principles of individualised treatment, conducive to socio-economic conditions of India and with availability of abundance of formulations for any particular disease, use of food items as medicine and lifestyle rules, Ayurveda enjoys a better place as far as prevention and cure of the disease is concerned in comparison to western medical system. Kerala's economic development is to be centred on Ayurveda, information technology and tourism in the coming days (Chitrarajan, 2002).

16. Social Relevance of Ayurveda

An affordable system of health care is the dream of human society. Modern system of medicine has made rapid strides often with magical solutions for problems of health. But it has also made the medical and health services highly expensive and unaffordable to the common man. It is in this context that Indian heritage medical system is becoming a boon to provide a cost-effective alternative. It has a significant sociological bearing especially for those who cannot afford expensive health services on account of various socio-economic factors. Thus Ayurveda is destined to become a socially relevant system of medicine.

Spirituality had always been the backbone of Indian Sciences. Ayurveda had always recommended a code of conduct for a healthy mind and healthy body. This has started making an impact on the society and people have started practicing yoga, meditation, self-regulation, and moderation etc. Ayurveda is influencing the tourism industry as well. People have started appreciating the soothing effects of oil bath massaging etc. Nutraceuticals and cosmetics are becoming Ayurveda based. Acceptance of Ayurveda will eventually bring

around the society to accept our basic values in life. Change is a very slow process. But apart from the economic advantage, Ayurveda will definitely have a sobering effect on humanity (Thara, 2002).

The limitation of modern medical science in controlling various diseases like AIDS, Cancer, Leukemia and Alzheimer's are forcing modern scientists to look for various alternative systems of medicines for controlling such challenging disorders. Adoption of Ayurveda seems to be one of the best possible solutions to such problems because of its cost effective and safe medicines. Global acceptance of simple and safe Ayurvedic health delivery system can be made affordable to the poorest of the poor in the developing and underdeveloped countries. Ayurveda does not limit to its coverage on human beings alone. It deals with the treatment of plants and animals also.

17. Ayurveda in the context of Globalisation

The central phenomenon, which will hallmark the turn of the century, will be the globalisation of Ayurveda. It is understood that Ayurveda is a science and art of healing and hence it has to have a global character. In recent years there has been a growing interest in Ayurveda both in its holistic principles and its safe treatment modalities (Ramachandran, 2002).

Information Technology is a powerful tool in the hands of the developed and information rich countries in the globalisation process. The term globalization has been used in a multiplicity of senses. In its most general sense, globalization refers to cross - national flows of goods, investment, production and technology. The Alma Ata declaration of WHO in 1980 has created major awareness about Ayurveda in the Western World. The demand for Ayurveda in foreign countries is multifaceted which actually determines its present status in respective countries. This impact is rapidly changing the picture of Ayurveda in India as well as abroad (Patel, 2000).

Ayurveda and its allied system focus on universal applicability. India being one of the world's 12 mega bio-diverse countries which account for 8 per cent of the recorded species of the world with 45,000 plant species. India is rich in information and genetic materials as well. India is sitting on gold mine of well-recorded and well-practised knowledge of herbal medicine. So now the Indian Ayurvedic industry wants to do original and developmental research with the help of information technology for new and user-friendly products. Otherwise, the technologically superior transnational corporations will play havoc in the field. It will be detrimental to the traditional Ayurvedic industry. (Narayan, 2003).

18. Patents and Intellectual Property Rights in Ayurveda

Many people in India feel that Ayurveda should not be allowed to globalize because of the chances of its exploitation by the multinationals at the cost of Indian economy and national interest. With the advent of new patent regime and intellectual property rights, the apprehensions in this regard have further increased. However it seems that because of the prevailing legal and economic provisions at international level, the phenomenon of globalization cannot be prevented and moreover India is the preacher of the philosophy of "Vasudhaiva Kudumbakam", which means 'the whole world is a family' for centuries (Singh, 2000).

The idea of open World Trade led to the emergence of General Agreement on Tariffs and Trade (GATT), and the Trade Related Intellectual Property Rights (TRIPs). The greatest concern is the issue of linking the intellectual property with trade in new patent régime creating a situation where the trade will overwhelm the intellectual property. This is against the interest of India. In the context of Ayurveda and similar other assets of traditional national heritage, it is rather unfortunate that like Indian Patent Act 1970, the World

Trade Organization too does not make provision of protection of the ancient traditional national heritage of India.

19. Biopiracy in Ayurveda

Biopiracy means taking biological resources from one country or region to another and using it in the latter's industry, agriculture or other commercial process. The loss of indigenous knowledge related to medicinal uses of bio-diversity is bio-piracy - the piracy and patenting of traditional knowledge. In the earlier decades of last century taking away bio resources from one country to another was not considered illegal and therefore the concept of biopiracy was non-existent (Fowler, 1996). With the growth of knowledge in the field of biological conservation, especially in terms of in situ and ex situ conservation, biopiracy received international recognition. Countries now have started recognising their sovereign rights over the biological material within their boundaries (Agarwal, 1996). Recent developments in the international arena seem to reinforce the process of protecting biological resources of one country from being exploited by another. Biopiracy is now not permissible. An international treaty called the Convention of Biological Diversity (CBD) has converted biological resources from a "common heritage of mankind" to a "national property" and signatory countries are expected to frame laws to this effect (Asif, 1998).

Biodiversity of medicinal plants is the basis of Ayurvedic healing. The appropriation and patenting of Ayurvedic knowledge is another threat to the free flourishing of Ayurveda in the future. The patenting of *nimba* (Azardirachta indica), *haridra*(curcuma longa), *aswagandha* (Withania somifera), *maricha* (piper nigram), *ardraka* (zingiber officinale), *karavellam* (momordica charantia)...... is not just an assault on the collective, cumulative innovations over millennia embodied in Ayurveda.

In the past, the threat Ayurveda faced was from marginilisation through neglect; today's threat comes from marginalisation through its commercial success and popularity. The sudden popularity of Ayurveda poses threat to its integrity as a knowledge system and system of healing. Patents on traditional Ayurvedic knowledge are doubly wrong- first, traditional knowledge is by its very nature not novel, it is not an invention. It should hence lie beyond the purview of patentability. Secondly, exclusively rights and monopolies go against the spirit of Ayurveda which treats healing as a gift, not a commodity (Vandana Shiva, 2003).

20. Standardisation of Ayurvedic Drugs

At present the lack of standardisation and quality control in Ayurvedic medicine is a major hurdle for marketing it internationally as a global medicine. Ayurveda is one of the most important and efficient systems of medicine from the ancient age to the modern era. To improve its activity, standardisation and quality control are most essential for global market. Standardisation of such drug is mostly complex as well as time-consuming. Tremendous industrialisation has led to commercialisation. Today most of the classical drugs are replaced by patent drugs, which make their way in the international market.

Standardisation of raw drugs is an absolute necessity, because to get standardised product, use of standardised raw materials is essential. Hence standardisation must begin from the stage of acquiring and processing of raw drugs. Preparation of drugs in Ayurveda requires internationally acceptable standards. So it is necessary to consider the internationally recommended guidelines related to the process validation or process standardisation. The international norms, mostly all the recommendations and guidelines available now, are more related to the modern pharmaceutical process. The standardisation means the assurance of quality of drugs and formulations with

regard to its composition, efficacy and genuineness in terms of measurable parameters (Prajapathi, 2002).

Standardisation and quality control should be taken care of to promote export of Ayurvedic medicine to make Ayurveda popular and acceptable to the people at large (Varrier, 2002). With growing globalisation and international demand for improvements of quality of herbal drugs parameters for standardisation has to be generated for all products (Saxena, 2002). Standardisation of Ayurvedic drugs is an indispensable part of Indian System of medicine, as it is inevitable for world-wide acceptance. Traditional medicine though firmly established in clinical side but there are no scientific methods to ascertain the standard, purity and exact nature of finished products. The industry has to bid adieu to the traditional ways and should adopt modern analytical methods. As herbal polypharmaceuticals are a mixture of numerous chemical molecules, the term standardisation has to give way to the better-enhanced quality control with the application of information technology.

20.1. Good Manufacturing Practice (GMP)

GMP refers to the Good Manufacturing Practice Regulations promulgated by the U S Food and Drug Administration under the authority of the Federal Food, Drug and Cosmetic Act. The "GMP is used internationally to describe a set of principles and procedures which when followed by manufacturers of therapeutic goods, helps to ensure that the products manufactured will have the required quality (www.health.gov.au, 2002). Good Manufacturing Practice is a system for ensuring that the products are consistently produced and controlled according to quality standards (www.who.int, 2002). GMP is important because of poor quality medicines are not only a health hazard, but also a waste of money for both governments and individual consumers. Most countries will only accept import and sale of medicines that have been manufactured by internationally recognised GMP.

According to the statistics available from the Office of Deputy Drug Controller (Ay.), Trivandrum, GMP in Kerala was first introduced in the year 2000. In the same year three firms obtained GMP and four firms obtained GMP in 2001. In the year 2002 there was a steep increase in the possession of GMP certificate with 69 firms. In the year 2003 there were 74 firms which obtained GMP. In the year 2004, 66 Ayurvedic firms obtained GMP. The growth of GMP shows that within the short span of four years, 216 firms (24 percent) upgraded their manufacturing units into the GMP standards. The growth of GMP is graphically represented in figure 2.

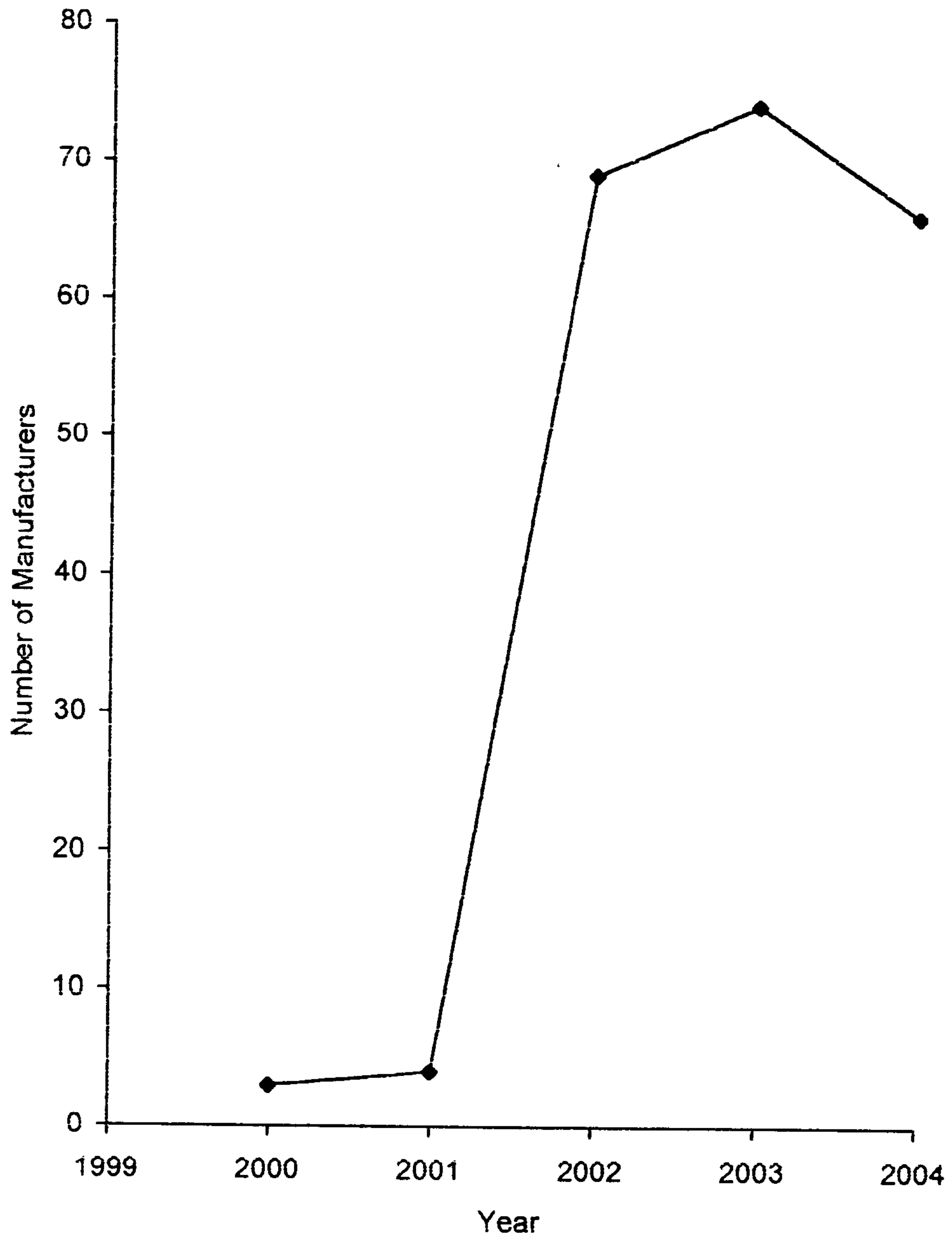
Fig. 2. Growth of GMP in Kerala
80
70
60
50
40
30
20
10
0
Number of Manufacturers
1999
2000
2001
2002
2003
2004
Year

21. Research in Ayurveda

It is commonly believed, not only by the public but also by the Ayurvedic physicians that, there was no research in ancient India, when Charaka and Sushrutha wrote their treaties. All the writing was based on personal experience and intuition of sages. The general notion is that Ayurvedic seers have discovered the valuable knowledge through divine intuition and insight that the ordinary mortal scientists of today cannot attain. Any science, including Ayurveda has been formulated through generations of observations, evaluations and experience. It includes scientific observations, experimentation and logical inferences (Anil Kumar, 2002). The Ancient sages of Ayurveda have written everything after careful research. The whole Vimanasthana of Charaka dealing with the methodology of research, has given so many new concepts, which, if accepted, will give a new dimension to our present knowledge of research and the possibility of modernisation of Ayurveda (Shukla, 2003).

Ayurveda has got a vast scope of research in the fields like fundamental research, clinical research, drug research and literary research. But there is a stronger need to develop suitable methodology both clinical as well as laboratory-oriented, based on modern technology and Ayurvedic fundamentals and approaches to enable Ayurvedic research in true sense to grow and to evaluate Ayurvedic remedies on global level. Several objective parameters based on Ayurvedic concepts and modern technology need to be developed which may have universal acceptance to revive, update and promote Ayurvedic Research in true sense (Varshney, 2003).

Research in Ayurveda at the national and global levels continue to focus heavily on herbal / herbo mineral remedies for various diseases with pharmacological, phytochemical, botanical / pharmocognostic and clinical studies (Satyavati, 2003). On the other hand several modern medical scientists

initiated scientific research on Ayurvedic drugs especially single drugs. Most of such studies were carried out at laboratory level and not much clinical research was carried out to prove the clinical efficacy of such drugs with the application of modern technology (Sharma, 2003). Ayurvedic research generally attempts at the second objective. Traditionally established facts are challenged and scrutinised here in the light of new knowledge. This is essential for keeping the science in tune with the times.

Ayurvedic research should essentially be directed in such a way that this research helps in development of Ayurveda as a global system, its results benefit the common man, real practitioners and manufacturers of Ayurveda and there is a growth of credibility and confidence in the system. The problems of research should be formulated in terms of Ayurvedic principles and modern technology and approaches; of course the programme will have to be launched with due scientific temper utilising available scientific tools and techniques specially designed for the purpose. It will be necessary to analyse all laboratory findings, radiological investigations like MRI, Ultrasound scan, Angiography etc. in terms of morbid factors described in Ayurveda (Anil Kumar, 2002).

22. Information Technology

The impact of information explosion reveals that the needed information at any moment appears to be diverse and diffuse. It should be processed, analysed, synthesised and tailored for easy assimilation and consumption. Thus the capacity to handle and disseminate information to pertinent users is an important activity. It is noteworthy that the possession of the capacity to handle information and knowledge becomes the means of access to and source of power and the potential for material wealth, as a society tends towards technological and industrial growth. (Karisiddhappa and Padhi, 1989).

Information Technology represents an assembling of technologies. These technologies are the computer ability to store and process information, and the communication technology, which represents transmitting information to location where it may be needed (Gopinath, 1995). Information technology is in fact an emergence of three strands of technologies, computer, microelectronics and communication.

Information Technology in its wider sense can be defined as any technology related to recording, presentation and communication of information or knowledge emerged from time immemorial. On the other hand new information technology connotes the massive applications of electronic or digital technologies for the recording, presentation and communication of information and knowledge (Fjallbrant, 1990). Due to modern development in IT, information is now instantly available all over the globe and may be stored and retrieved as long as electricity is available. Time and space no longer restrict the exchange of information (Lunendjk, 1994).

Information Technology has affected the research process profoundly. Creating opportunities for scientific exploration through new instrument and analytical capabilities; permitting research collaborations to extend cheaply and efficiently across the globe and improving the capacity for displaying results as visual images. New technologies, as well as integration of existing technologies into national and global systems, offer further opportunities to enhance the productivity of research. (Clement, 1990).

23. The Information Society

Modern society can be rightly be designated as information society in which information has become the strategic resource for all major societal activities (Soman, 2001). The concept of information society emerged in the 1970s. With the development of digital technologies since the 1960's there has been a steady convergence between information technology and communication

technologies. This has led to the emergence of new Information and Communication Technologies (ICTs). The last decades of 20th century saw the growth of the Information Society, where ICTs play a major role in the development of almost all spheres of life. In an information society, the quality of life as well as prospects for social change and economic development depends increasingly upon information and its exploitation (Martin, 1995). The information society can be defined as " the society currently being put into place, where low - cost information and data storage and transmission technologies are in general use. This generalisation of information and data use is being accompanied by organisational, commercial, social and legal innovations that will profoundly change life both in the world of work and in society generally (HLEG, 1997). In information society everyone is empowered with the ability to communicate and access information, freely and without barrier. It is a society where all sectors public, private, education, individual citizens and communities can interact with seamless ease.

The new revolution in IT is creating an Information Society wherein information forms the basis for economic and cultural production and consumption. Information generation and processing are at the roots of the new productivity and the sources of wealth and power are the informational capacity of each society (Chopra, 2001). Information is a valuable resource and an intellectual property. It transforms natural resources to useful products (Nair, 2000). In the Information age, the information and knowledge are vital resources in gaining and retaining competitive advantage and in the creation of wealth. Essentially information society will transform the way we live. ICTs offer the opportunity to revolutionize the quality of life and economic well-being. These new technologies affect how people work and conduct business, engage in leisure and entertainment activities, learn, participate in the political processes, access public services and so on (Pohjola, 2001)

24. The Knowledge Society

Knowledge society is not only about digitised information or about electronic networks. The transformation of knowledge society can only be understood if it is viewed in a broader context, as a social process where bits, networks, and knowledge have a social context. In knowledge society, everything is not information, technology or knowledge (Castells, 1997). Technology itself exists in a context of meaningful social practice, and technological change cannot be understood without understanding the process of social change. Although technology has always been fundamentally a social change, when information and communication technology penetrates everyday life, these technologies become protean platforms for social change. Based on the results of the current work, it, indeed, seems that a new type of society is emerging. The ongoing transformation is a profound one. It will change the lifestyle, organisations, politics, and values (Mangla, 2003).

The emergence of the knowledge society, built on the pervasive influence of modern information and communication technologies, is bringing about a fundamental reshaping of the global economy. Its significance goes well beyond the hyping of the Internet or the dramatic declines in the dot.com sector. What is underway is transformation of the economy and society (Tuomi, 2001). Knowledge has always been a factor of production, and a driver of economic and social development. The digitisation of information and the associated pervasiveness of the Internet are facilitating a new intensity in the application of knowledge to economic activity, to the extent that it has become the predominant factor in the creation of wealth.

25. Cyber Society

The cyber society is called networked society and the one which is willing to explore the opportunities for deviance that are opened up by computer networks. The future shape of the society, depends upon the smooth

running of computer networks (www.unn.ac.uk, 2001). It describes the origins of the term in the libertarian dream of an independent, self – contained, self-ruled and unregulable society of equals in cyberspace (Muller, 2000).

It is knowledge and wisdom based highly networked society. Wisdom and knowledge can be very effectively and efficiently utilised. It is independent, at the same time interconnected. It cannot ignore the global changes. Wisdom and knowledge of a society can effectively be utilised through cyber society. Knowledge and wisdom are most used in this society. This is expanding globally day by day. Society's wisdom and knowledge are efficiently utilised in cyber society (Jones, 1995).

26. Medical Informatics

Medical informatics is the application of computers in medical care. It is defined as the study, invention, and implementation of structures and algorithms to improve communication, understanding and management of medical information. The end objective of the medical informatics is the coalescing of data, knowledge, and the tools necessary to apply that data and knowledge in the decision - making process, at the time and place that a decision needs to be made. The focus on the structures and algorithms necessary to manipulate the information separates medical Informatics from other medical disciplines where information content is the focus (Bemmel and Musen, 1999)

27. Cyber Medicine

Cyber Medicine is the discipline of applying the Internet to medicine. As an offspring of the information revolution, Cyber Medicine is rapidly transforming medicine into a virtual marriage of fields as disparate as the medical sciences, business and commerce, electronics, psychology, philosophy and health economics. Cyber medicine is the Internet-driven practice of

medicine where patients communicate with physicians through electronic mail (Ellen, 2001). Physicians who practise cyber medicine are called cyberdoctors. Cyber medicine allows patients to receive on-line advice from cyberdoctors, who hold themselves out as medical professionals. Cyberdoctors diagnose patients' symptoms, prescribe medication over the Internet, and advise on how to treat varying ailments. Patients simply have to locate a medical website, such as www.cyberdocs.com, type in their medical history, a description of their ailments, a credit card number, and an e-mail address. Upon receipt of this information a cyberdoctor reviews it and administers a diagnosis and treatment advice. The cyberdoctor can call in a prescription to a local pharmacy and the patient may retrieve the medicine or have it sent by mail Cyber Medicine is not a sub-set of something else -- it is the embodiment of 21st century medicine (Diepgan and Essenbach, 1998).

28. Information Technology in Ayurveda

Ayurveda, the ancient science of healing was an outcome of the past age social scientific thinking. The lack of writing technology made man to propagate Ayurveda, like other Indian systems from one person to another for which the language and method of presentation were designed known as Aphorisms (Sutras). After industrial revolution, the rate of growth in science and technology was very fast, resulting in the inventions of computers, which are having the capacity to memorise and analyse millions of data in a nanosecond. But in practice unfortunately, even 50 per cent of the available data does not appear to be utilised by the present day practitioners, perhaps with very few exceptions. Hence it is natural for an individual of the present age who is exposed to Ayurveda, and also to computer technology, to think in the lines of application of information technology in Ayurveda so that it could be utilised for present practical applications of diagnosis and treatment (Shajahan, 1998).

28.1. Computerised Ayurvedic Studies

The computerised Ayurveda studies have identified several important factors that affect the current and future role of computers and Information Technology in Ayurveda treatment. These factors include advances in information science, biotechnology and computer hardware and software, changes in the background of Ayurveda professionals, changes in the medicolegal climate and changing strategies for healthcare.

28.1.1. Body Tune (Computerised Ayurvedic Medicare) (CAM) (1983)

Body Tune, the interactive Computerised Ayurvedic Medicare software concepts contribute to Ayurveda in three basic interrelated ways. It detects and communicates data about the physical conditions. It interprets that data, and actively assists in assessment and accurate diagnosis. It helps to organise the diagnostic method in a classical way envisaged by Indian Sages of Ayurveda. CAM was clinically tested by Gujarat Ayurveda University in 1993 developed by Dr. M.A. Shajahan. Its efficiency has been tested in patients and found correct. This software was particularly meant for determination of Tridosha (Vata, Pitta, Kapha) aspects only, not for any specific disease. This was the first attempt ever made in bringing computers in the field of Ayurveda. Its second and third versions came in 1988 and 1990 respectively (Shajahan, 1993).

28.1.2. Prakes (1987)

Prakes is an expert system for estimation of Prakrti (body constitution) developed by CIRA (Centre for Informatics Research Advancement, Kerala). It was aimed at building a system to estimate the Prakrti of a person.

28.1.3. Prakrti Determination and Health Guidance by Computer (1989)

This is an expert system designed and developed by Chaitanya Consultancy, Pune. It gives users Prakrti, health advice regarding diet, instructions about daily activities, likely illness and measures for its prevention.

28.1.4. Pilex (1990)

This software is intended to diagnose the piles, its prognosis, complications and treatments. It was developed in Basic language in Gujarat Ayurved University, Jamnagar.

28.1.5. Madhava: Ayurvedic Diagnostic System (1991)

Centre for Development of Advanced Computing, Pune has developed this diagnostics expert system based on Ayurvedic System of Medicine to diagnose a wide variety of disease. This system is developed to aid physicians in cases when the necessary information for a precise diagnosis is unavailable.

The system is capable of on – line learning as well as updating, thereby providing a scope for upgrading the system. In this system, the physician would conduct an interactive dialogue about the patient by proving information and responding to the questions generated by the system. The output of the system is a list of possible diagnosis with a certainty greater than a predefined level. The system acts as an advisor, and the physicians have the final responsibility about diagnosis of the disease as well as administration of the medicine and treatment.

28.1.6. Rasex (1992)

This package was developed by Government Ayurvda College, Trivandrum, CIRA, and ER & DC, Trivandrum. In this package an attempt has been made to correlate the pharmacological properties with that of therapeutic properties with the help of computer. A database was created after collecting, organising and storing all the pharmacological and therapeutic properties of single rasa drug using dBase III plus. A list of drugs, which conforms to the physician's specifications is collected and displayed (Shajahan, 1993).

29. Current Problems in Ayurveda

Ayurveda is truly acknowledged by the intelligentsia and the common folk alike as the most popular sciences. The scientific design of the Ayurvedic system of diagnosing and treating the patients, rather than the disease of the patient, one would feel that the system was being developed with the intention to wholly suit itself to any condition and in particular to application of new technologies. In the field of medical care and health services of the third world countries, the traditional system of medicine plays a vital role along with the modern medicine. While modern medicine is developing at a great speed, there is a tendency to ignore or even relinquish the traditional system of medicine in these countries. At the same time traditional system is on the verge of extinction or even disintegration mainly due to the scrupulous plundering of traditional wisdom and knowledge related to the traditional system of medicine by modern medicine (Mathew, 1998). So there is an urgent need for conducting a very detailed and systematic study of social application of the information technology in this system of medicine so as to modernise them to withstand the challenges of the time . In other words medical informatics in the context of the traditional system of medicine is a vast untapped area of study, which could be developed by a proper integration of information technology and traditional system of medicine without deviating from its fundamental principles.

For the modernisation of Ayurvedic system and to change it from the traditional framework to modern lines, there is an urgent need to change the mindset and the thinking horizon of both practitioners and manufacturers. Then the practitioners and manufacturers realise the necessity of modernisation and adoption of new technologies in Ayurveda and its global chance in this century as the most useful alternate system of medicine. So in order to convert Ayurveda to global level from the traditional way, it is necessary to adopt the latest technological tools and scientific framework similar to modern medicine.

In the context of globalisation one has to take into account the fact that Ayurveda is not only a treatment, but it is a full system of medicine also. As such the greatest difficulty in its globalisation is the lack of competent manpower with required communication skills, which may help in propagating the knowledge of Ayurveda as a science and a system. The lack of good multilanguage literature on Ayurveda suitable for globalisation of knowledge is another problem in this mission. Other major problems are the lack of awareness about the phenomenon of globalisation of knowledge and its application, their legal and commercial dimensions, inadequate patent laws to protect the traditional national heritage, legal obstacles in the use of Ayurvedic drugs and formulations outside India. The slow and inadequate research and development activities and lack of economic and infrastructural inputs in the field of Ayurveda, lack of standardisation and quality control of Ayurvedic drugs and half-hearted industrialisation and lack of attention to conservation and cultivation of medicinal plants also pose problems. Now it is the era of wisdom and knowledge-based industry. Ayurveda is a century-old wisdom. If the changes are to be adopted fundamentally, and then Ayurvedic medicine can flourish at global level.

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REVIEW OF RELATED LITERATURE

CHAPTER III

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Adequate knowledge about the studies which have already been conducted is necessary for pursuing any research work. It is necessary to understand how the researchers had approached the concept earlier. The researcher gets proper direction from the related studies which had been conducted earlier. Review of related literature will help to pursue the research in a systematic and scientific manner. The literature in any field forms the foundation upon which all the future works are built. In order to avoid duplication of work also, proper literature survey is necessary. The present study is basically a conceptual framework for the application of information technology in Ayurveda. The review of the literature related to this study is presented in this chapter.

Austin (1989) in his study "*information technology and the future of health services delivery*" examined the dramatic ways that information technology will influence the health care strategic management, and organization of the health care delivery system in the years ahead. Advances in the microprocessors, telecommunication, mass storage of data and images, and input - output devices will be accompanied by increased use of health-related software packages, standardized patient record formats and coding system will facilitate system integration and networking of computers. Clinical decision support system will assist physicians in medical diagnosis and treatment. Computer enhanced medical imaging and other non-invasive procedures will reduce surgery, patient pain, discomfort, and costs. Automation will get closer to the patient management information and decision support systems will be central to effective management in a highly competitive environment of clinical practice.

Haynes and Ramsden (1989) in their study "*A review of medical education and medical informatics*" explained how advances of information technology may help physicians to manage information more effectively accessible, validated clinical databases of diagnostic test characteristics, computerized clinical activities with feedback, expert systems, online access to the medical literature, and other tools of medical informatics.

He further stressed that medical educators can catalyze this process by facilitating the introduction of information technology into academic clinical settings so that students can learn its use first hand by promoting the evolution of this and other aspects of medical informatics, a new discipline dedicated to the solution of information problems in health care.

Sujoy Guha (1992) in his study on the application of IT in healthcare system over the past 15 years found that there had been a rush to derive all possible benefits from IT and areas like expert systems had received a special thrust on account of the demands of the health care system. He also identified that the major areas where IT could be applied are health research, diagnosis and therapeutics etc. He observed that IT can improve the overall efficiency of the health care system.

Shajahan (1993) who conducted a study on "*clinical evaluation of Ayurvedic pharmacological principles based on computerized Ayurvedic medicare*" had developed a software called Computerized Ayurvedic Medicare. It detects and communicates data about the physical conditions; interprets that data and assists in assessment. His studies emphasised that with this software an Ayurvedic practitioner can do dosha assessment, to find medicines for various diseases, to view and search medicinal plants with its Ayurvedic properties, rasa guna relation, climatology and sodhana schedule etc. to print case sheet or result request sheets.

Altman (1997) in his research paper *"Informatics in the care of patients: ten notable challenges"* explained the concepts and conceptual relationship within biomedical information and how they can be harnessed for practical applications. In the past, the field has exploded as health professionals recognise the importance of strategic information management and the inadequacies of traditional tools for information storage, retrieval and analysis. He emphasised the primary goals of medical information, as for any other branch of biomedical research, are to improve the overall health of patients by combining basic scientific and engineering insights with the useful application of information technology.

Degoulet and Fiesch (1997) in their research study on *"Critical dimensions in medical informatics"* explained a typology of medical informatics applications in proposed dimension of information and knowledge, and the aspects of the cyber society. The medical informatics appears more as technology driven by external forces such as the general progress of medicine, of the integration of economical constraints in the choice of barriers to overcome as well as challenges for future research.

Nordstorm (1998) in his research study *"exploring pluralism - the many faces of Ayurveda"* explained that Ayurveda is commonly approached as a single coherent tradition of medicine characterised predominantly by the doctrines of clinical practitioners, and medical infrastructure that support it, the rich diversity of empirical indigenous medicine. In practice, Ayurveda is a dynamic phenomenon that offers multifaceted approaches to healing. He further emphasised that in this light, Ayurveda emerges as a plural system in itself.

Ram Mohan (1998) in his study *"information technology in Ayurveda"* revealed the possibilities of application of information technology in Ayurveda. According to this study, Ayurveda can develop only through the

application of information technology. He emphasises that IT will enhance the overall efficiency of the Ayurvedic treatment

Shajahan (1998) in his article "*Computer and Ayurveda*" revealed the use of computerised Ayurvedic packages to improve speed and accuracy in diagnosis and treatment and save time and labour of practitioners .

Mohanty *et al* (2000) in their research paper "*production of standard quality drugs in Ayurvedic pharmacy*" narrated the need to produce the standard quality drugs in Ayurveda. They also elaborated on the production of standard, effective and genuine drugs in required quantity and utmost qualities, which is the challenge for pharmacy and processing units for Ayurvedic drugs. They argue to fulfil the demands of medical world, the genuine raw materials and their processing up to the finished products, including preservation, packing, sampling, labelling and therapeutic instruction are required to update the pharmacy industry by providing genuine drugs of correct pharmaceuticals in an internationally acceptable standard.

Muruganadam *et al* (2000) in their study "*Standardisation of herbal formulations*" explained about the herbal products and their use by world population. They found that herbal products and herbal therapies gained a wide popularity in the past decade. They explained that the standardisation of herbal formulations includes establishing and maintaining the organoleptic physico-chemical, biological and chemical standards for finished products containing single or multiple herbal ingredients.

Reeja (2000) conducted a "*Study on the application of information technology for modernisation of traditional medicine practised by the Vaidya community in Kozhikode district* ". The study revealed that modernisation is needed in conventional Ayurveda treatment practice and the application of

information technology is needed in every aspect of traditional medicine like Ayurveda in diagnosis, treatment and preparation of medicine.

Raghunathan (2000) in his paper "*standardisation of raw drugs*" explained Ayurveda as a veritable cornucopia of a number of useful drugs belonging to vegetable, animal and mineral kingdom. The quality of the pharmaceutical products depends not only on the care taken in its preparation, but also in confirming that the correct raw drugs have been used, and the material has been correctly processed. In view of the growing popularity and global interest in Ayurveda and its drug lore, there is imminent need for a well-co-ordinated multi-disciplinary research touching pharmocognosy, pharmaceutics, photochemistry, pharmacology and applied studies.

Wilson (2000) in his study "*using computers in health information systems: in design and implementation of health information system*" used computers in health information system. The study revealed that the introduction of computers provided the opportunity for a complete rethinking of information needs of physicians and change of attitude towards the utility of data for diagnosing and decision making.

Bates, D.W. *et al* (2001) in their research paper "*reducing the frequency of errors in medicine using information technology*" explained that error in medicine is frequent and results in substantial harm. The goal of their paper is to describe how the frequency and consequences of errors in medical care can be reduced by the use of information technology in the provision of care, and to make general and specific recommendations regarding error reduction through the use of information technology. The appropriate increase in the use of information technology in healthcare especially the introduction of clinical decision support and better linkages in and among systems, resulting in process simplification- could result in substantial improvement in patient safety.

Battman and Shultz (2001) in their research paper *"Telepathology application of an emerging technology"* explained the development of modern telecommunication by means of high-speed data transfer either by normal telephone lines or the Internet. He explained that instead of mailing slides, today images can be transferred electronically within seconds around the world for diagnosing the disease and treatment of the patients. Besides teleconsultation, telediagnosis is the most sophisticated application of telepathology.

Chan (2001) in his study on *"information technology and emerging medicine: present and future"*, analysed the role of new technology that enhances the speed and storage. The information technology is very much helpful in the emerging situation of the illness of patients. The emphasis on the supportive clinical information and images could be retrieved in computer workstation through the use of Picture Archive Communication System (PACS) technology. He further explains the expert systems commonly will be employed on the top of the clinical information systems so as to enhance the decision support for emerging physicians and global sharing of clinical data will be the future trend.

Eger and Godkin (2001) in their paper *"Physicians adoption of information technology: A consumer behaviour" elaborated* physicians adoption of information technology reports, the physicians resistance to information technology in a time when the practice of medicine could benefit from technological support. This paper integrated the information technology and consumer behaviour literatures to discuss physicians' acceptance, adoption and application of information technology in their practice.

Joshi (2001) conducted a study "*Design and development of Indian National Information System for Ayurveda*" on the infrastructure facilities available in the libraries and information centres attached to various Ayurveda institutions in India and information needs of various categories such as qualified and traditional Ayurvedic practitioners, scientists, teachers, researchers and students. He further suggested the need for designing a national information system for Ayurveda, which will satisfy the information needs of practitioners and other users in Ayurveda.

Behera and Bhuyan (2002) in their study "*Standardisation of Ayurvedic formulation and its importance in present era*" discussed the standardisation of Ayurvedic formulations. The Standardisation of Ayurvedic drugs is an indispensable part of Indian system of medicine as it is inevitable for worldwide acceptance. Traditional medicines though firmly established in clinical side but there are no scientific methods to ascertain the standard, purity and exact nature of finished products. So they suggested that the pharmaceutical industry has to bid adieu to the traditional ways and should adopt modern analytical method. As herbal poly pharmaceuticals are a mixture of numerous chemical molecules, the term standardisation has to give way to the better-enhanced quality control.

Bhutada (2002) narrated in his study "*Ayurveda the only way to combat modern life style*" the increasing use of modern luxurious and better communication and advertisement, life had become sedentary, inviting trouble. The modern way of living invites many diseases such as hypertension and cardiac ailments, depression, self-medication obesity, psychosomatic disorders, addiction, suppression of sympathy iatragenic condition etc. The Ayurvedic way of life teaches to maintain with nature, and could help to improve the health.

Jaya and Heera (2002) in their research study on the "*Role of Ayurveda in primary health care*" explained that, health is a state of complete physical, mental and social well being and not merely an absence of disease or infirmity. The values of human life and the aims and objective of Ayurveda were discussed to establish the role of Ayurveda in primary health care. They assure that taking into consideration of all these factors, Ayurveda in primary health care is inevitable.

Kundaney (2002) in his research paper "*role of computer software technology in Ayurvedic diagnosis*" explained the three doshas namely, Vata, Pitta and Kapha, which are the primary causes of health and illness. He pointed out to combat these drawbacks; efforts have been put to computerise the existing signs, symptoms and their control by computer software technology.

Lindberg (2002) in his article titled "*Medicine in the 21st century: global problems, global solutions*" discussed the application areas of information technology in medicine and health care. Important application areas of Information Technology in medicine and healthcare as described by him are appropriate individual access to medical knowledge, the new medico-engineering developments such as new radiant imaging method and the implantable pacemaker devices, mathematical modelling for understanding the working of the human body, the computer based patient record as well as new knowledge in molecular biology, human genetics and biotechnology.

Mathur (2002) in his paper "*An introduction to the integration of traditional medicine and modern medicine*" explained the need for the integration of traditional medicine and modern medicines as there is a growing interest in the modern medicine among the social scientists, modern medicine practitioners, health planers and administrators of WHO and UNICEF. The study also focused attention to draw an alternative approach to the unification of traditional medicine with the special reference to tribal medicine and modern medicine system so as to extend their utilisation to needy people.

Shaffer *et al* (2002) studied in their paper called *"What is digital medicine"* the changes in healthcare. The modern practice of scientific medicine depends on the existence of the written and printed word to store medical information. As computers can transform information as well as store it, new digital tools cannot only record clinical data; they can also generate medical knowledge. He pointed out in doing so, it is possible to develop digital medicine that is potentially more widely distributed, and more egalitarian than current medical practice.

Sharma (2002) in his study *"Exploration of new herbal resources: a study on Bhupali."* found that the herbal resources of India depend on their vegetable source to a major extent for medicinal purpose. The herbal drugs that are described in the literatures of Ayurveda have already got attention at global level. The consideration in the ethno-botanical practices was established in Ayurveda since very beginning and the directions are already there how to approach a drug for therapeutic purpose. He emphasised that exploring the ethno - botanical knowledge is vital for the development of herbal resources.

Sreevidya (2002) in her research study *"computerised dosha assessment"* explained Ayurveda - being the first world health science of living- considers man as an epitome of universe. As a part of that, Ayurveda describes the human body composed of three bio regulatory principles viz. vata, pitta and kapha and seven datus and malas. Fitness for purpose being the main motto of any science, the standardisation of concepts and products is essential. So the standardisation of tridoshas can be done through information technological aid and diagnosed precisely and accurately with computer.

Dave and Nirmal (2003) in their research paper *"ways and means to achieve the goal of globalisation of Ayurvedic education"* explained the need of Ayurvedic education in the original form to focus attention how to globalise the Ayurvedic education for health, longevity and moral upliftment of people in

India and abroad. The paper also dealt with the scope, sphere, principles, parameters and planning of uniform teaching, text books and project for foreign medical professional to high light the prominent features of Ayurveda.

Joseph (2003) in his research paper "*quality control and standardisation of herbal drugs through microscopic studies*" explained that the demand for Ayurvedic drugs is increasing and international standards for quality control is necessary to introduce them in the world market. He also studied on the manufacture of drugs with genuine raw materials. The genuinety was established with the microscopic studies, which emerged as a major tool for accurate identification of the crude drugs.

Mangalasseri and Rao (2003) in their research paper "*Conceptualisation of research protocols for Ayurvedic health care system*" explained unique research methodology based on its own fundamental principles. In the present times Ayurvedic research studies are facing a lot of problems due to the blind adoption of modern research methodologies which turns neither acceptable to modern world nor to Ayurveda. They made an attempt to analyse the present problems in the field of research and to suggest suitable modification in the research protocols.

Panda (2003) in his paper on the "*need of standardisation in process of Ayurvedic drug manufacturing*" pointed out that the success of treatment depends mostly upon the qualitative drugs. Several Acharyas modified new things in the drug preparation and formulations according to their experience from time to time. Now to meet the global demand for Ayurvedic drugs, certain parameters for standardisation of the genuine manufacturing process has been established.

Shivkumar *et al* (2003) in their research paper "*organic standardisation of Ayurvedic drugs*" explained the increasing need for Ayurvedic drugs from world wide has now created a new opportunity to cultivate the medicinal plants

and process them in commercial scale. This paper deals with the organic standardisation of Ayurvedic herbs at the level of cultivation, processing and also for finished products. It also deals with the details of various organic certifying agencies from worldwide.

Singh and Sharma (2003) in their paper on "*the Clinical research in Ayurveda in a global perspective*" presented the need for clinical research in the treatment of disease and in individualistic treatment based upon Prakruti, Vikruti, Sara, Sanchana, Pranmana, Desa, Kala and Satva etc. In the present era it is very difficult to select the effective compounds and preparations in the management of particular disease. He stressed the importance of evaluation of the clinical efficacy of different drugs and compound preparations described in various scientific parameters, which needs massive research and application of new technologies.

Thomas (2003) in his research work "*Clinical networks for doctors and managers*" elaborated the health care networks that link group of health professionals and organisations with primary, secondary, and tertiary care, enabling them to work together in a co-ordinated way, unconstrained by professional and organisational boundaries to ensure equitable provision of high quality, effective services to patients.

Varma and Kushwala (2003) in their paper "*Challenges and future in Ayurveda*" explained that all responsibility lies on the doctors' shoulders and they cannot abide by that. They also pointed out that there is enough knowledge around people, the job is to manage all this and utilise in a proper strategic way for the strategic challenge ahead. They emphasised that the knowledge management is critical to the success of Ayurveda.

Vikramaditya and Prakash Joshi (2003) conducted a study on "*microbial quality assurance of Ayurvedic drugs*" which studied the quality

assurance in the manufacture of Ayurvedic drugs formulation by systematic and comprehensive studies. They also found out that the presence of micro organism in Ayurvedic preparation constitutes a potential hazard for two reasons. It may result in the spoilage of the product and may constitute an infection hazard to the consumers and patients.

CONCLUSION

The studies reviewed in this chapter enable the investigator to conclude that:

1. The studies on the application of information technology in Ayurveda are very few.
2. The studies on information technology in modern medicine were large.
3. The studies on the Ayurvedic treatment, manufacture of medicine and their standardisation were very few.

As the investigator could not find a worth while study on the application of information technology in the treatment and preparation of medicine in Ayurveda, it is hoped that this study will be a valuable contribution in the field of both Ayurveda and library and information science.

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METHODOLOGY

Hemachandran Nair. G "Study of the application of information technology in the treatment and preparation of medicine in ayurveda with special reference to Kerala" Thesis. Department of Library & Information Science, University of Calicut, 2005

CHAPTER IV

METHODOLOGY

Variables
Objectives
Hypotheses
Tools used for data collection
Sample used for the study
Sampling technique used
Sample size
Data collection procedure
Consolidation of data
Statistical techniques used

METHODOLOGY

Methodology refers to the sum total of the procedures followed by the investigator to make the study scientific and valid. The quality of any research depends on the method adopted and the tools and techniques used for data collection and analysis. The nature of the problem and the kind of data needed for its solution determine the method of the study.

The present study, though conducted in the field of information science, is an attempt to explore the application of information technology in the treatment and preparation of medicine in Ayurveda. The basic research method applied to carry out the study is survey method. The methodology followed for the study is described under the following headings.

1. Variables,
2. Objectives,
3. Hypotheses,
4. Tools used for data collection,
5. Sample used for the study,
6. Sampling technique used,
7. Sample size,
8. Data collection procedure,
9. Consolidation of data and
10. Statistical techniques used.

1. Variables

The variables of the study are discussed below.

1.1. Variables of Ayurvedic Practitioners

The major variable under study is the application of IT in the diagnosis and treatment by Ayurvedic practitioners.

The following are the classificatory variables.

a) Age

b) Gender

c) Qualification

d) Experience and

e) Specialisation of the practitioners

1.2. Variables of the Manufacturers

The major variable under study is the application of IT in the preparation of Ayurvedic medicine.

The size of the manufacturing firms is taken as the classificatory variable

2. Objectives

1. To examine the relevance of Ayurveda as an alternate system of medicine.
2. To asses the present level of application of IT in the treatment of diseases by Ayurveda system.

3. To identify whether there exists any significant difference among different groups of Ayurvedic practitioners in the use of IT in their practice.

4. To explore the extent of modernisation in the preparation of Ayurvedic medicine by the application of IT.

5. To understand whether there exists any significant difference between large/medium and small firms in the application of IT in the manufacture of Ayurvedic medicine.

6. To explore the level of research and development in Ayurveda.

7. To explore the possibilities of IT application in the treatment and manufacture of Ayurvedic medicine.

3. Hypotheses

1. Ayurveda is a highly relevant alternate system of medicine in the modern times.

2. The level of use of IT in the Ayurvedic treatment is poor.

3. There exists significant difference among different groups of Ayurvedic practitioners in the use of IT in their practice.

4. The modernisation in the preparation of medicine by the use of IT in Ayurveda is not extensive.

5. There exists significant difference between large/medium and small firms in the application of IT in the manufacture of Ayurvedic medicine.

6. The level of research and development in Ayurveda is low.

7. There is wide scope for application of IT in the treatment and manufacture of Ayurvedic medicine.

4. Tools Used for Data Collection

Appropriate tools are necessary for collecting the required data. Hence, constructing the tools is an important task of an investigator. In the present study, the investigator, with the help of his guide and experts, has constructed the following tools for data collection.

4.1. Questionnaire for Ayurvedic Practitioners and

4.2. Questionnaire for Manufacturers of Ayurvedic Medicine.

4.1. Questionnaire for Ayurvedic Practitioners

The questionnaire for the Ayurvedic practitioners is drafted considering the way of diagnosis and treatment by the Ayurvedic practitioners.

The questionnaire is prepared by the investigator with the help of his guide and experts in the field and literature available, to study the existing trend and application of IT.

The questionnaire of the Ayurvedic practitioners include the following variables.

1. Type of diagnostic methods used
2. Mode of Keeping the records of the patients
3. Modern Diagnostic equipment used for diagnosis
4. Special interest in the medicines of firms
5. Way of updating the developments
6. Awareness on the scope of Ayurveda

7. Ayurveda as a global science
8. Knowledge in IT of the Practitioners
9. Utilisation IT in Practice
10. Future Plan for using IT in practice
11. Online treatment
12. Computer aided Diagnosis
13. IT and efficiency of Ayurvedic practitioners
14. Research and development in Ayurveda

4.2. Questionnaire for Manufacturers of Ayurvedic Medicine

The questionnaire for manufacturers of Ayurvedic medicine includes the following.

1. Mode of keeping the accounts of the raw materials and distribution of drugs.
2. Type of drug production adopted.
3. Pharmacopoeia adopted for drug production.
4. Way of updating the knowledge in drug production.
5. Awareness on the scope of Ayurveda
6. Ayurveda as a global science .
7. Knowledge of IT of manufacturers.
8. Utilisation of IT in drug production.
9. Future Plan for using IT in drug production

10. E-commerce on Ayurvedic drugs.

11. IT and efficiency of Ayurvedic drug production.

12. Research and development in Ayurvedic drug production.

5. Sample Used for the Study

It is not practical to study the whole population to arrive at generalizations though the results of the research is to have universal application. The process of sampling makes it possible to draw valid inferences or generalisations on the basis of careful observation of variables within a relatively small proportion of population. A sample is a small proportion of a population selected for the study.

In the present study the population is the Ayurvedic practitioners and drug manufacturers of Kerala. According to the Annual report of the Indian System of Medicine and Homoeopathy in India in the year 2000 , there are 14000 registered Ayurvedic practitioners and 900 drug manufacturers in Kerala. This population is too large in size to collect data from the entire population. Hence, the investigator selected a representative sample of this population to conduct the study.

6. Sampling Technique Used

The population consists of Ayurvedic practitioners and drug manufacturers of Kerala. The investigator identified the practitioners as the first step. They are Ayurvedic physicians, faculty members of Ayurveda colleges, and eminent traditional practitioners i.e. those who have traditional qualifications like Vaidya Booshanam, Ayurveda Bhooshanam, and Vaidya Kalanidhi etc. In order to get a representative sample, practitioners from the three regions of the state viz. Travancore, Cochin and Malabar were taken.

Other sub samples of the Ayurvedic practitioners were determined according to their characteristics such as age, gender, education, experience and specialisation.

In order to get samples from Ayurvedic drug manufacturers, the investigator identified the Ayurvedic drug production firms from the three regions of Kerala state. Other sub samples of the Ayurvedic manufacturers were determined as large, medium and small firms according to their size. The size of the firm is determined by the volume of drugs produced in a year. The large scale firms are those which produce drugs worth Rupees 2 crores and above in a year. Medium scale producers are those firms which produce drugs worth Rupees 50 lakhs to 2 cores annually. Small scale firms are those which produce drugs worth rupees 5 lakhs to 50 lakhs in a year.

In order to give representation to all these, the investigator has adopted the stratified random sampling technique.

7. Sample Size

For the present study the investigator decided to take a sample of 150 Ayurvedic practitioners (50 from each region) and 60 manufactures from the three regions (20 from each region) of the state. The sample of the Ayurvedic practitioners who responded to the (data collection) survey from the three regions are 110. The number of the Ayurvedic drug manufacturers who responded from the three regions of the state for the study is 50. Thus the final sample consists of 110 practitioners and 50 manufacturers.

The basal sample of Ayurvedic practitioners and manufacturers are given in Table 3 and Table 4.

Table 3

Breakup of the Final Sample of the Practitioners

<table>
<tr><th colspan="2">Characteristics of Ayurvedic practitioners</th><th colspan="2">No. of practitioners (N)</th><th>Percentage</th></tr>
<tr><td rowspan="3">Age</td><td>Below 45 years</td><td colspan="2">59</td><td>53.64</td></tr>
<tr><td>Above 45 years</td><td colspan="2">51</td><td>46.36</td></tr>
<tr><td>Total</td><td colspan="2">110</td><td>100.00</td></tr>
<tr><td rowspan="3">Sex</td><td>Male</td><td colspan="2">74</td><td>67.27</td></tr>
<tr><td>Female</td><td colspan="2">36</td><td>32.73</td></tr>
<tr><td>Total</td><td colspan="2">110</td><td>100.00</td></tr>
<tr><td rowspan="6">Qualification</td><td>Degree - BAM/BAMS</td><td>35</td><td rowspan="3">55</td><td>31.81</td></tr>
<tr><td>Diploma – DAM</td><td>17</td><td>15.46</td></tr>
<tr><td>Traditionally qualified</td><td>3</td><td>2.73</td></tr>
<tr><td>Postgraduate – MD</td><td>52</td><td rowspan="2">55</td><td>47.27</td></tr>
<tr><td>Ph. D</td><td>3</td><td>2.73</td></tr>
<tr><td>Total</td><td colspan="2">110</td><td>100.00</td></tr>
<tr><td rowspan="3">Experience</td><td>Below 20 years</td><td colspan="2">65</td><td>59.09</td></tr>
<tr><td>Above 20 years</td><td colspan="2">45</td><td>40.91</td></tr>
<tr><td>Total</td><td colspan="2">110</td><td>100.00</td></tr>
<tr><td rowspan="3">Specialization</td><td>Specialized</td><td colspan="2">37</td><td>33.64</td></tr>
<tr><td>General</td><td colspan="2">73</td><td>66.36</td></tr>
<tr><td>Total</td><td colspan="2">110</td><td>100.00</td></tr>
</table>

Table 4

Breakup of the Sample of the Manufacturers

Size of firms	Number of firms	Percentage
Large	3	6.00
Medium	27	54.00
Small	20	40.00
Total	50	100.00

8. Data Collection Procedure

The investigator first sought permission from Ayurvedic practitioners and manufacturers to meet them personally and hand over the questionnaires to them. After making necessary copies of the tools, the investigator met the Ayurvedic practitioners and manufacturers in person. Necessary instructions were given in the facing sheet of the questionnaire for filling them. The majority of the practitioners and manufacturers responded positively by filling up and returning the questionnaire. The response was encouraging.

9. Consolidation of Data

The data collected through the questionnaire were consolidated separately. The data were then subjected to further statistical treatment.

10. Statistical Techniques Used

The statistical analysis of data was done with the help of computer with the statistical package called SPSS (Statistical Package for Social Science). The statistical techniques used for analysis of data are described below.

1. Percentage analysis.

2. The z-test for significance (Devore, 2000)[4] to find out whether significant difference exists among the practitioners according to age, gender, qualification, experience and specialisaton and between large/ medium and small firms.

The Z-test was applied using the formula:

$$Z = \frac{(p_1 - p_2)}{\sqrt{P(1-P)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Where

p1	=	proportion of the first sample
p2	=	proportion of the second sample
n1	=	number of the first proportion
n2	=	number of the second proportion

$$P = \frac{p_1 n_1 + p_2 n_2}{n_1 + n_2}$$

REFERENCE

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ANALYSIS

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CHAPTER V

ANALYSIS

ANALYSIS

The analysis of data is one of the most important stages of research, involving critical examination of the data with the objectives in mind for determining the pattern of relationship among the variables. Quantitative analysis of data involving the application of various statistical techniques is most often essential in social research. Analysis of data involves a number of closely related operations which are performed with the purpose of summarising and organising the collected data to arrive at conclusions. The term analysis refers to the computation of certain measures along with searching for patterns of relationship that exists among data groups (Kothari, 1990). The method and depth of analysis are determined by the type of the study and the complexity of the hypotheses.

In the present study, the statistical treatment of the collected data is done to find out the application of IT by the Ayurvedic practitioners in the diagnosis and treatment using Ayurveda system and in the preparation of Ayurvedic medicine.

Percentage analysis is used to find out the various IT based equipment in the diagnosis, treatment and preparation of medicine in Ayurveda. To find out whether there exists any significant difference among the practitioners and among the manufacturers, the Z-test is applied with the help of a statistical package called SPSS (Statistical Package for Social Sciences).

1. Profile of the Practitioners

The profile of the Ayurvedic practitioners is presented in Table 5. The total sample of Ayurvedic practitioners selected for this study is 110. From this Table it can be seen that 53.64 percent of the practitioners are below 45 years of age and 46.36 percent practitioners are above 45 years. As far as the gender of the practitioners is concerned, 67.27 percent of them are males. The percentage of female practitioners is 32.73

Table 5 shows that 31.81 percent of the practitioners have degree (B.A.M./B.A.M.S.) in Ayurvedic medicine. At the same time 15.46 percent of the Ayurvedic practitioners have diploma (D.A.M.) and 2.73 percent of the practitioners have traditional qualifications like Vaidya Booshanam, Ayurveda Bhooshanam, and Vaidya Kalanidhi etc. The percentage of practitioners who have postgraduate (M.D.) degree in Ayurvedic medicine is 50 (47.27 + 2.73) percent (including Ph.D. holders). The percentages of practitioners with Ph.D. in Ayurvedic medicine is 2.73.

Table 5

Profile of the Practitioners

<table>
<tr><th colspan="2">Characteristics of Ayurvedic practitioners</th><th colspan="2">No. of practitioners (N)</th><th>Percentage</th></tr>
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<tr><td>Total</td><td colspan="2">110</td><td>100.00</td></tr>
</table>

The Ayurvedic practitioners below 20 years of experience are 59.09 percent and above 20 years of experience are 40.91 percent. There are 33.64 percent practitioners who have specialisation in Ayurvedic medicine, while 66.36 percent practitioners have no specialisation and are general practitioners.

For the sake analysis, the graduate, diploma holders and traditional practitioners are taken together(35+17+3=55) and postgraduate practitioners including Ph.D holders are taken together (52+3=55).

2. Professional Variables

The professional variables of the Ayurvedic practitioners include, the consultation of patients, the type of diagnostic methods following and keeping the records of the patients. They also include the modern diagnostic equipment used for diagnosis and treatment, special interest of medicines of a particular Ayurvedic firm, people's awareness about Ayurvedic medicine and global chances of Ayurveda as a most favoured alternate system of medicine.

2.1. Consultation of Patients

Table 6

The Daily Consultation of Patients

No. of Patients	No. of Practitioners	Percentage
Less than 10	23	20.90
10-20	60	54.55
20-30	22	20.00
Above 30	5	4.55
Total	110	100.00

Table 6 shows that 20.90 percent of the practitioners have below ten patients daily on an average for consultation. Among the practitioners 54.55 percent have 10 to 20 patients daily and 20 percent have between twenty to thirty patients daily. Only 4.55 percent of the practitioners have more than

thirty patients daily for consultation. From this it is evident that the majority of the practitioners treat ten to twenty patients daily on an average.

2.2. Type of Diagnostic Methods Adopted

Table 7

Methods of Diagnosis

Methods	No. of Practitioners	Percentage
Mixed	82	74.55
Modern	24	21.82
Traditional	4	3.63
Total	110	100.00

Table 7 shows that 74.55 percent of the practitioners resort to mixed way of diagnosis for the treatment. That means they adopt both modern and traditional Ayurvedic ways. There are 21.82 percent practitioners who adopt modern way of diagnosis and 3.63 percent who follow the traditional way of diagnosis. Thus the result shows that the majority of the practitioners resort to mixed way of diagnosis.

Table 8

Distribution of Practitioners Resorting to Different Type of Diagnosis

Type of diagnosis	Age		Sex		Qualification		Experience		Specialisation	
	Below 45 years	Above 45 years	Male	Female	Deg / Dip	PG	Below 20 years	Above 20 years	Spl.	Gen
Mixed Diagnosis	59.32 (35)	92.16 (47)	77.03 (57)	69.44 (25)	90.91 (50)	58.18 (32)	63.08 (41)	91.11 (41)	51.35 (19)	86.30 (63)
Z value	*3.942***		*0.856*		*3.939***		*3.318***		*3.975***	
Modern Diagnosis	33.90 (20)	7.84 (4)	20.27 (15)	25.00 (9)	7.27 (4)	36.36 (20)	30.77 (20)	8.89 (4)	37.84 (14)	13.70 (10)
Z value	*3.299 ***		*0.564*		*3.693***		*2.731***		*2.896 ***	
Traditional Diagnosis	6.78 (4)	0.0	2.70 (2)	5.56 (2)	1.82 (1)	5.45 (3)	6.18 (4)	0.0	10.81 (4)	0.0
Z value	-		*0.749*		*1.018*		-		-	
Total	59	51	74	36	55	55	65	45	37	73

*Significant at 5% level. ** Significant at 1% level

Figures in parentheses are number of respondents

2.2.1. Practitioners Resorting to Mixed Diagnosis

Table 8 shows that 59.32 percent of the practitioners of age below 45 years resort to mixed way of diagnosis, combining both traditional and modern ways. At the same time 92.16 percent of the practitioners of age above 45 years are utilizing mixed way of diagnosis. The percentage shows that there is a good amount of difference between the practitioners in both these age groups. The Z value (3.942) signifies that the difference between these two age groups in the use of mixed way of diagnosis is significant both at 5 percent and 1 percent level of significance. (The Z value above 1.96 indicates significant at 5 percent level and above 2.58 indicates significant at 1

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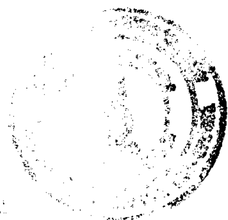

percent level). The percentages show that those who are in the age group above 45 years are using the mixed way of diagnosis more extensively than the practitioners in the age group below 45 years.

The gender wise analysis shows that 77.03 percent of the male practitioners use mixed way of diagnosis. But at the same time 69.44 percent of the female Ayurvedic practitioners use mixed way of diagnosis. The Z value (0.856) which is not significant shows that there is no much difference in the use of mixed way of practice among the two gender groups.

Table 8 shows that 90.91 percent of the practitioners with degree/diploma and 58.18 percent of the practitioners with postgraduate degree resort to mixed way of diagnosis. The Z value (3.939) shows the significance of the difference between the proportions of practitioners resorting mixed way of diagnosis among the qualification groups which is found to be statistically significant even at one percent level. The result shows that those who do not have postgraduate degree are resorting more to mixed way of diagnosis that combine traditional as well as modern ways of diagnosis.

Table 8 shows that 91.11 percent of the practitioners with more than twenty years of experience are using mixed way of diagnosis. At the same time 63.08 percent of the practitioners with experience below twenty years use mixed way of diagnosing. The Z value (3.318) shows the difference between the proportions of the practitioners in two qualification groups who are using mixed way of practising. This is statistically significant at one percent level. The result shows that more experienced practitioners resort to mixed way of diagnosis at a higher level than the less experienced practitioners.

Table 8 shows that 86.30 percent of the general practitioners and 51.35 percent of the specialist practitioners resort to mixed way of diagnosis for the treatment. The Z value (3.975) shows that there exists significant difference

between the proportions of the percentages between the two groups. The result shows that general practitioners resort to mixed way of diagnosis more.

2.2.2. Practitioners Resorting to Modern Diagnostic Methods

Table 8 shows that 33.90 percent of the Ayurvedic practitioners who have below 45 years of age and 7.84 percent of the practitioners having above 45 years of age resort to modern way of diagnosis. The Z value (3.299) shows that there is significant difference between the proportions of practitioners in the two age groups. The result thus indicates that practitioners of younger group is using modern diagnostic methods more.

The gender wise analysis shows that 25 percent of the female practitioners and 20.27 percent of the male practitioners are using modern ways of diagnosis. The Z value (0.564) shows that there is no much difference in the use of modern way in these two gender groups.

Among the postgraduate practitioners 36.36 percent use the modern way of diagnosis and 7.27 percent of the practitioners with degree / diploma use modern way of diagnosis. The difference between them is about five fold. The Z value (3.693) shows the difference between the proportions of the practitioners resorting to modern way of diagnosing the disease among the two qualification groups. The result shows that more qualified practitioners resort to modern methods of diagnosis more.

Among the practitioners having below 20 years of experience, 30.77 percent use modern way of diagnosing. At the same time 8.89 percent of the practitioners having above twenty years experience resort to modern methods of diagnosis. The Z value (2.731) shows that there is significant difference between the proportions of practitioners in these two groups resorting to modern way of diagnosis. The result thus indicates that practitioners with experience below 20 years utilise modern way of diagnosis more. This means

that the younger practitioners are resorting more to modern diagnostic methods.

There are 37.84 percent-specialised practitioners who utilise modern way of diagnosis. At the same time 13.70 percent of the general practitioners resort to modern way of diagnosis. This shows that their difference is more than double. The Z value (2.896) shows that the difference between the proportions of the practitioners using modern way of diagnosis is statistically significant. This means that the specialised practitioners prefer to use modern diagnostic methods in their practice more than the general practitioners.

2.2.3. Practitioners Resorting to Traditional Methods of Diagnosis

Among the practitioners who have below the age 45 years, 6.78 percent are using traditional methods and there is no practitioner above the age level of 45 years resorting to traditional methods for diagnosis.

Table 8 shows that 5.56 percent of the female practitioners and 2.70 percent of the male practitioners resort to the traditional way of diagnosis. The Z value (0.749) shows that there is no much difference in the proportions of the two gender groups and it is not statistically significant.

There are 5.45 percent postgraduate practitioners and 1.82 percent practitioners with degree/diploma who use traditional way of diagnosis. The Z value (1.018) shows that there is no significant difference in the proportions of the two groups.

There are 6.18 percent among the practitioners who have below 20 years of experience who resorts to traditional diagnostic methods and there is no practitioner above 20 years experience who resort to traditional diagnostic methods.

Table 8 shows that 10.81 percent of the specialised practitioners use traditional way of diagnosis and there is no general practitioner resorts to traditional methods of diagnosis.

2.3. Records of Patients

The medical practitioners usually keep the medical records of their patients related to their diagnosis and the course of treatment for future reference. Table 9 and 10 show the details.

Table 9

Records of Patients

Keeping Records	No. of Practitioners	Percentage
Yes	105	95.45
No	5	4.55
Total	110	100.00

Table 9 shows that 95.45 percent of the Ayurvedic practitioners keep records of the disease and course of treatment of their patients and 4.55 percent of the practitioners do not keep records of their patients.

Table 10

The Way of Keeping Records of Patients

Type of Records	No. of Practitioners	Percentage
Case sheet	86	78.18
Register	17	15.45
Computer	2	1.82
Not keeping	5	4.55
Total	110	100.00

Table 10 shows that 78.18 percent of the practitioners keep the records of their patients as case sheet and 15.45 percent of the practitioners keep the records in separate register. Only 1.82 percent of the Ayurvedic practitioners keep the records of their patients in computer. Thus, it can be observed that the application of IT in this regard is less.

2.4. Use of Modern Diagnostic Equipment

In Table 11 the selected modern equipment used for diagnosis and treatments by Ayurvedic practitioners are analysed. This is to find out the use of these equipment by the Ayurvedic practitioners in their practice. There are 90 percent of the practitioners who resort to ECG. Those who use X-ray constitute 99.09 percent. The practitioners adopt MRI scan for diagnosis of disease is 43.64 percent. Among the practitioners, 98.18 percent use clinical laboratories for testing various things like urine, blood, cholesterol etc. for the diagnosis of disease.

Table 11

Usage of Modern Equipment for Diagnosis

Equipment	No. of practitioners	Percentage
ECG	99	90.00
MRI	48	43.64
X Ray	109	99.09
Clinical Lab	108	98.18
CT Scan	51	46.36
Ultrasound	49	44.55
Angiography	6	5.45

There are 46.36 percent practitioners who use CT scan and 44.55 percent who resort to Ultrasound scans for diagnosis. However, only 5.45 percent of the practitioners use Angiography for diagnosis of disease. Here the practitioners who use the above equipment for diagnosis are only studied and the remaining practitioners do not use these equipment for diagnosis. The table shows that the use of IT based equipment is not high among the Ayurvedic practitioners.

2.4.1. Usage of Electro Cardiogram (ECG)

Table 12

Distribution of Practitioners Resorting to ECG for Diagnosis

Equipment	Age		Sex		Education		Experience		Specialisation	
	Below 45 Years	Above 45 years	Male	Female	Deg	PG	Below 20 Years	Above 20 Years	Spl.	Gen
ECG	96.61 (57)	82.35 (42)	86.49 (64)	97.22 (35)	81.81 (45)	98.18 (54)	96.92 (63)	80.00 (36)	91.89 (34)	89.04 (65)
Z value	*2.486 **		*1.761*		*2.860***		*2.909***		*0.471*	

*Significant at 5% level. ** Significant at 1% level
Figures in parentheses are number of respondents

Table 12 shows the use of ECG by the Ayurvedic Practitioners in diagnosis and treatment. Electrocardiogram (ECG) is an electrical recording of the heart and is used in the investigation of heart disease. There are 96.61 percent of the practitioners below 45 years of age and 82.35 percent practitioners above 45 years of age who resort to ECG for diagnosis. The Z value (2.486) which is not significant at one percent level but significant at 5 percent level shows the difference between the proportions of practitioners using ECG in the two age groups. The result thus indicates that usage of ECG is more among the younger practitioners.

There are 97.22 percent female practitioners and 86.49 percent male practitioners who use ECG for diagnosis. The Z value (1.761) shows that the difference in the percentages of the proportions of the two gender groups is not significant. This means that no significant difference exists between the two gender groups of practitioners using ECG.

Table 12 also reveals that 98.18 percent of the postgraduate practitioners and 81.81 percent of practitioners with degree/diploma utilise ECG for diagnosis. The Z value (2.860) shows that the difference between the proportions of practitioners using ECG in these two groups is statistically significant. The result thus shows that usage of ECG is more among the practitioners with postgraduate degree.

The analysis shows that 96.92 percent of the Ayurvedic practitioners below 20 years of experience and 80 percent of the practitioners above 20 years of experience use ECG for diagnosis of diseases. The Z value (2.909) shows that the difference between the proportions of practitioners using the ECG in the two experience groups is found to be so large and it is statistically significant. The result thus shows that usage of ECG is more among the practitioners who have below 20 years of experience.

There are 91.89 percent practitioners with specialisation and 89.04 percent general practitioners who resort to ECG for diagnosis. The Z value (0.471) shows that there is no significant difference in the proportions of the percentages between the two groups. This means that no significant difference exists between the two groups in the use of ECG for diagnosis.

2.4.2. Usage of MRI (Magnetic Resonance Image) Scan

Table 13

Distribution of Practitioners who Resort to MRI Scan for Diagnosis

Equipment	Age		Sex		Education		Experience		Specialisation	
	Below 45 years	Above 45 years	Male	Female	Deg / Dip	PG	Below 20 Years	Above 20 years	Spl.	Gen
MRI Scan	55.93 (33)	29.41 (15)	39.19 (29)	52.78 (19)	21.81 (12)	65.45 (36)	52.31 (34)	31.11 (14)	67.57 (25)	31.51 (23)
Z value	*2.796 ***		*1.348*		*4.614 ***		*2.203**		*3.603***	

*Significant at 5% level. ** Significant at 1% level
Figures in parentheses are number of respondents

Magnetic Resonance Image (MRI) Scan is a method of producing extremely detailed pictures of body tissues and organs without the need for x-rays. The electromagnetic energy that is released when exposing a patient to radio waves in a strong magnetic field is measured and analysed by a computer, which forms two- or three-dimensional images that may be viewed on a TV monitor.

Table 13 shows that 55.93 percent of the Ayurvedic practitioners below 45 years of age and 29.41 percent of the practitioners above 45 years resort to MRI scan. The Z value (2.796) shows that there is significant difference between the proportions of the practitioners using MRI scan according to age. This indicates that usage of MRI is higher among the practitioners of age below 45 years.

Table 13 also shows that 52.78 percent of the female practitioners and 39.19 percent of the male practitioners are utilising MRI scan for diagnosis. The Z value (1.348) shows that there is no much difference in the proportions of the percentages of the two gender groups as it is not statistically significant.

There are 65.45 percent postgraduate practitioners and 21.81 percent practitioners with degree/diploma resort to MRI scan. The Z value (4.614) which is significant shows the difference between the proportions of practitioners in the two qualification groups in using the MRI scan. This reveals that more qualified practitioners are using latest technology like MRI scan to diagnose the disease more.

Table 13 also shows that 52.31 percent of the Ayurvedic practitioners who have below 20 years of experience and 31.11 percent of the practitioners with above 20 years of experience use MRI scan for diagnosis. The Z value (2.203) shows that the difference between the proportions of the practitioners in these two groups using MRI scan is statistically significant. The result thus indicates that the usage of MRI scan is more among the junior practitioners

Table 13 shows that 67.57 percent of the specialised practitioners and 31.51 percent of the general practitioners resort to MRI scans for diagnosis. The Z value (3.603) shows that there is significant difference between the proportions of practitioners of these two groups using MRI scan. So the usage of MRI scan for diagnosis is more among specialised practitioners.

2.4.3. Usage of X – Ray

Table 14

Distribution of Practitioners who Resort to X-ray for Diagnosis

Equipment	Age		Sex		Education		Experience		Specialisation	
	Below 45 years	Above 45 years	Male	Female	Deg / Dip	PG	Below 20 years	Above 20 years	Spl.	Gen
X-ray	100 (59)	98.04 (50)	98.65 (73)	100 (36)	100 (55)	98.18 (54)	100 (65)	97.78 (44)	100 (37)	98.63 (72)
Z value	*1.080*		*0.700*		*1.000*		*1.207*		*0.715*	

Figures in parentheses are number of respondents

Table 14 shows that all the practitioners of age below 45 years use X-ray for diagnosis. At the same time 98.04 percent of practitioners above 45 years use X- ray for diagnosis. The Z value (1.080) shows the difference between the proportions of the two age groups of practitioners in the use of X-ray for diagnosis. As this is not statistically significant it can be observed that there is no much difference between these two groups in the use of X-ray for diagnosis.

There are cent percent female practitioners and 98.65 percent male practitioners who use X-ray for diagnosis. The Z value (0.700) which is not significant indicates that there is no much difference in the percentages of the male and female practitioners in the use of X-ray.

All practitioners having degree/diploma and 98.18 percent of the postgraduate practitioners use X-ray for diagnosis. The Z value (1.00) which is not significant shows that there is no much difference between these groups in the use of X-ray.

Cent percent of the practitioners below 20 years of experience and 97.78 percent of the practitioners above 20 years of experience use X-ray. The Z value (1.207) which is not statistically significant shows that there is no much difference in the percentages of these two groups.

Cent percent of the specialised practitioners and 98.63 percent of the general practitioner use X-ray for diagnosis. The Z value (0.715) shows that there is no much difference in these percentages and hence not statistically significant. The result thus shows that irrespective of age, gender, qualification, experience and specialisation, most of the of practitioners resort to X-ray for diagnosis.

2.4.4. Usage of Clinical Laboratories

Table 15

Distribution of Practitioners Resorting to Clinical Laboratories for Diagnosis

Equipment	Age		Sex		Education		Experience		Specialisation	
	Below 45 years	Above 45 years	Male	Female	Deg / Dip	PG	Below 20 years	Above 20 years	Spl.	Gen
Clinical Laboratory	100 (59)	96.08 (49)	97.30 (72)	100 (36)	98.18 (54)	98.18 (54)	100 (65)	95.56 (43)	100 (37)	97.26 (71)
Z value	*1.535*		*0.995*		-		*1.715*		*1.016*	

*Significant at 5% level. ** Significant at 1% level

Figures in parentheses are number of respondents

Table 15 shows that all the practitioners below 45 years and 96.08 percent of the practitioners above 45 years use clinical laboratory reports for diagnosis. The Z value (1.535) shows that there is no much difference in the

proportions of the percentages of these groups as the Z value is not significant.

Cent percent female practitioners and 97.30 percent of the male practitioners are using laboratory reports for diagnosis. The Z value (0.995) which is not significant shows that there is no much difference in the percentages of the male and female practitioners in the case of the use of laboratory reports.

There are 98.18 percent practitioners with degree / diploma and 98.18 percent postgraduate practitioners who use laboratory reports for diagnosis. Since both the percentage levels are same, Z value is not calculated.

The cent percent of the practitioners below 20 years of experience and 95.56 percent of the practitioners above 20 years of experience resort to laboratory reports for diagnosis. The Z value (1.715) which is not statistically significant shows that there is no much difference in the percentages of these two groups in the use of laboratory reports.

All the specialised practitioners and 97.26 percent of the general practitioners depend on laboratory reports for diagnosis. The Z value (1.016) which is not significant shows that there is no much difference between these groups in the use of laboratory reports.

The result thus shows that the majority of practitioners resort to clinical laboratory reports for diagnosing the disease. This shows that clinical laboratory testing is extensively used for the diagnosis of disease in the Ayurvedic treatment.

2.4.5. Use of C T Scan (Computed Tomography)

Table 16

Distribution of Practitioners Resorting to CT Scan for Diagnosis

Equipment	Age		Sex		Education		Experience		Specialisation	
	Below 45 years	Above 45 years	Male	Female	Deg / Dip	PG	Below 20 years	Above 20 years	Spl. (37)	Gen (73)
CT scan	57.63 (34)	33.33 (17)	41.89 (31)	55.56 (20)	23.64 (13)	69.09 (38)	55.38 (36)	33.33 (15)	64.86 (24)	36.99 (27)
Z value	*2.547 **		*1.348*		*4.779***		*2.280**		*2.770***	

*Significant at 5% level. ** Significant at 1% level

Figures in in parentheses are number of respondents

In the CT Scan (Computed Tomography), the multiple computers are used to control the entire CT system. The main computer that orchestrates the operation of the entire system is called the "host computer." There is also a dedicated computer that reconstructs the "raw CT data" into an image.

The analysis in Table 16 shows that 57.63 percent of the practitioners below 45 years and 33.33 percent of the practitioners above 45 years use CT Scan for diagnosis. The Z value (2.547) shows that there is significant difference in the proportions of the percentages of these two groups. The result thus indicates that usage of CT Scan is more among the younger practitioners.

Table 16 also shows that 55.56 percent of the female practitioners and 41.89 percent of the male practitioners utilise CT scan for diagnosis. The Z value (1.348) shows that there is no significant difference in the proportions of the percentages. This means that no significant difference exists between the two gender groups, in this case.

There are 69.09 percent postgraduate practitioners and 23.64 percent practitioners with degree / diploma resort to CT scan for diagnosis. The Z value (4.779) which is significant shows the difference between the proportions of practitioners using CT scan. The percentages show that the CT scan is used more by the postgraduate practitioners .

It can also be seen that 55.38 percent of the practitioners who have below 20 years of experience and 33.33 percent practitioners who have above 20 years of experience use CT scan for diagnosis. The Z value (2.280) shows that the difference between the proportions of these groups is statistically significant. The result thus indicates that the usage of CT scan among the younger group is more.

There are 64.86 percent practitioners with specialisation and 36.99 percent general practitioners utilising CT Scan for diagnosis. The Z value (2.770) shows that the difference between the proportions of these two groups is significant. The percentages indicate that specialised practitioners are using the CT scan more for diagnosis.

2.4.6. Usage of Ultrasound Scan

Table 17

Distribution of Practitioners Resorting to Ultrasound Scan for Diagnosis

Practitioners	Age		Sex		Education		Experience		Specialisation	
	Below 45 years	Above 45 years	Male	Female	Deg / Dip	PG	Below 20 years	Above 20 years	Spl.	Gen
Ultrasound	55.32 (35)	27.45 (14)	44.59 (33)	44.44 (16)	23.64 (13)	65.45 (36)	56.92 (37)	26.67 (12)	64.86 (24)	34.25 (25)
Z value	*3.354***		*0.015*		*4.412***		*3.139***		*3.052***	

*Significant at 5% level. ** Significant at 1% level

Figures in parentheses are number of respondents

Ultrasound scans use sound waves to build up a picture of the inside of the body. They are completely painless. The ultrasound scanner has a microphone which gives off sound waves. The microphone is passed over the patient's body. The sound waves bounce off the organs inside the body, and are picked up again by the microphone as they bounce back. The microphone is linked to a computer. This turns the reflected sound waves into a picture.

Table 17 shows that 55.32 percent of the practitioners below the age group of 45 years and 27.45 percent of the practitioners above the age of 45 years resort to ultrasound scan. The Z value (3.354) shows that there is significant difference between the proportions of practitioners of these two groups. The result indicates that the usage of ultrasound scan among the younger group is more.

The analysis shows that 44.59 percent of the male practitioners and 44.44 percent of the female practitioners utilise ultrasound scan. The Z value (0.015) shows that there is no much difference in the proportions of the practitioners in the two gender groups. This means that no significant difference exists between the two gender groups in the case of the use of Ultrasound Scan.

There are 65.45 percent postgraduate practitioners and 23.64 percent practitioners with degree / diploma utilise ultrasound scan for diagnosis. The Z value (4.412) shows that there is significant difference between the proportions of the practitioners in these groups using ultrasound scan. The result thus indicates that the usage of ultrasound scan is more among the postgraduate practitioners.

The analysis shows that 56.92 percent of the practitioners who have below 20 years of experience and 26.67 percent of the practitioners who have above 20 years of experience resort to ultrasound scan for diagnosis. The Z value (3.139) shows that the difference between the proportions of the

practitioners in these groups using ultrasound scan is statistically significant. The result indicates that the use of Ultrasound scan is more among younger practitioners.

Table 17 also shows that 64.86 percent of the specialised practitioners and 34.25 percent of the general practitioner resort to ultrasound scan for diagnosis. The Z value (3.052) shows that there is significant difference between the proportions of the practitioners in these groups who use ultrasound scan. The result shows that the usage of Ultrasound scan is more among the specialised practitioners.

2.4.7. Usage of Angiography

Table 18

Distribution of Practitioners Resorting to Angiography for Diagnosis

Equipment	Age		Sex		Education		Experience		Specialisation	
	Below 45 years	Above 45 years	Male	Female	Deg / Dip	PG	Below 20 years	Above 20 years	Spl.	Gen
Angiography	5. 08 (3)	5.88 (3)	6.76 (5)	2.78 (1)	3.64 (2)	7.27 (4)	4.62 (3)	6.67 (3)	10.81 (4)	2.74 (2)
Z value	*0.183*		*0.862*		*0.839*		*0.465*		*1.761*	

Figures in parentheses are number of respondents

Angiography is an MRI study of the blood vessels. It utilises MRI technology to detect, diagnose and aid the treatment of heart disorders, stroke and blood vessel diseases. Coronary Angiography is an X-ray examination of the blood vessels or chambers of the heart. A very small tube (catheter) is inserted into a blood vessel in the patient's groin or arm. The tip of the tube is positioned either in the heart or at the beginning of the arteries supplying the heart, and a special fluid (called a contrast medium or dye) is injected. This

fluid is visible by X-ray, and the pictures that are obtained are called angiograms.

Table 18 shows that 5.88 percent of the practitioners above 45 years and 5.08 percent of the practitioners below 45 years of age utilise angiography for diagnosis. The Z value (0.183) which is not significant shows that there is no much difference in the percentages of use of these two groups.

There are 6.76 percent male practitioners and 2.78 percent female practitioners who utilise angiography for diagnosis. The Z value (0.862) shows that there is no significant difference between the proportions of the male and the female practitioners. This means that no significant difference exists between the two gender groups in the use of this method.

The Analysis shows that there are 7.27 percent postgraduates and 3.64 percent degree/diploma holders who resort to angiography for diagnosis. The Z value (0.839) which is not significant shows that there is no difference in the proportions of these groups in the use of this method.

Table 18 shows that 6.67 percent of the practitioners who have above 20 years of experience and 4.62 percent of the practitioners having below 20 years of experience utilise angiography for diagnosis. The Z value (0.465) shows that there is no significant difference in the proportions of these groups in the use this method. This means that no significant difference exists between these two groups, in the use of angiography.

There are 10.81 percent specialised practitioners and 2.74 percent general practitioners who use angiography for diagnosis. The Z value (1.761)which is not significant shows that there is no much difference in the proportions of these groups in the use of this method.

2.5. Special Interest in the Medicines of Firms

There are 900 Ayurvedic drug manufacturing firms in Kerala. Each firm has its own speciality in their preparation of medicine. So many Ayurvedic practitioners may prefer the medicines of certain firms for the treatment. Therefore they may have special interest in the medicines of a particular Ayurvedic firm.

Table 19

Special Interest in the Medicines of Firms

Special Interest	No. of Practitioners	Percentage
Yes	100	90.91
No	10	9.09
Total	110	100.00

Table 19 reveals that the percentage of Ayurvedic practitioners who have special interest in the medicines of a particular firm for the treatment is 90.91 percent. At the same time 9.09 percent practitioners have no interest in the medicines of a particular Ayurvedic firm. This shows that a great majority of the practitioners have special interest in the medicines of certain firms.

Table 20

Distribution of Practitioners with regard to the Special Interest in the Medicines of Particular Firms

Characteristics		Respondent		N	Z Value
		%	No		
Age	Below 45 years	84.75	50	59	1.915
	Above 45 years	98.04	50	51	
Sex	Male	91. 89	68	74	0.514
	Female	88.89	32	36	
Qualification	Degree/Diploma	94.55	52	55	1.327
	Postgraduate	87.27	48	55	
Experience	Below 20 years	86.15	56	65	1.827
	Above 20 years	97.78	44	45	
Area of Specialisation	Specialised	81.08	30	37	2.552*
	General	95.89	70	73	

*Significant at 5% level. ** Significant at 1% level

Table 20 shows that 98.04 percent of the practitioners above 45 years and 84.75 percent of the practitioners below 45 years have special interest in the medicines of a particular firm. The Z value (1.915) shows that there is no much difference in the proportions of the two groups. This indicates that there is no significant difference between these two groups in this case.

The analysis shows that 91.89 percent of the male practitioners and 88.89 percent of the female practitioners have special interest in the medicines of particular manufacturing firms. The Z value (0.514) which is not significant shows that there is no significant difference between the male and female practitioners in this case.

Table 20 shows that 94.55 percent of the degree / diploma holders and 87.27 percent of the postgraduate practitioners have special interest in the medicines of particular firms. The Z value (1.327) shows that there is no significant difference in the proportions of the two groups, which indicates that qualification has no bearing on he preference of a particular firm.

There are 97.78 percent of the practitioners who have above 20 years of experience and 86.15 percent of the practitioners below 20 years of experience who are interested in the medicines of particular firms. The Z value (1.827) shows that there is no significant difference in the proportions of these two groups. This reveals that experience is not a factor which influences preference of particular firms.

There are 95.89 percent general practitioners and 81.08 percent specialised practitioners who have interest in the medicines of particular manufacturing firms. The Z value (2.552) which is significant shows the difference between the proportions of the specialised and general practitioners. The results thus indicate that more general practitioners have special interest in the medicines of particular manufacturing firms.

2.6. Quality of Medicines of Different Firms

Table 21

Quality of Medicines of Different Firms

Quality of Medicine	No. of Practitioners	Percentage
Yes	2	1.82
No	108	98.18
Total	110	100.00

Table 21 shows that 98.18 percent of the Ayurvedic practitioners responded that different Ayurvedic firms do not have same quality in the same medicine. At the same time only 1.82 percent of the practitioners opined that different Ayurvedic firms have same quality in same medicine. This shows that a great majority of the practitioners have the opinion that the medicines of different firms have no same quality

2.7. Standardisation of Ayurvedic Medicines

Table 22

Standardization of Medicines

Attempt for standardisation	No. of Practitioners	Percentage
Yes	102	92.73
No	8	7.27
Total	110	100.00

Table 22 shows that 92.73 percent of the Ayurvedic practitioners responded that attempts are made to standardise the preparation of Ayurvedic medicine. At the same time 7.27 percent of the practitioners opined that there is no attempt to standardise the Ayurvedic medicine. The analysis reveals that great majority of the practitioners have the opinion that there is standardisation in Ayurvedic medicine.

2.8. Updating the Knowledge of Ayurvedic Practice

Table 23

Updating the Knowledge by the Ayurvedic practitioners

Updating the Knowledge	No. of Practitioners	Percentage
Yes	110	100.00
No	0	0.00
Total	110	100.00

Table 23 shows that cent percent practitioners responded that they update themselves with the new knowledge in the Ayurvedic medicine.

Table 24

Source of Information for Updating Knowledge

Materials	No. of practitioners	Percentage
Books	95	86.36
Journals	75	68.18
Seminars	98	89.09
Discussion	61	55.45
Internet	42	38.18

Table 24 shows that 86.36 percent of the practitioners get information from books for updating knowledge in the practice. At the same time 68.18 percent of the practitioners refer journals, 38.18 percent use Internet, 89.09 percent of the practitioners attend seminars and conferences to know the latest developments in Ayurvedic practice and 55.45 percent of the practitioners update the information by discussion with other practitioners. The results thus

reveal that the practitioners are interested to know the developments in their profession and among them only 38.18 percent of the practitioners resort to Internet for knowing the new developments in their profession.

2.9. Awareness of the Scope of Ayurveda

Table 25

Satisfaction in the Awareness on the Scope of Ayurveda

Satisfied	No. of Practitioners	Percentage
Yes	52	47.27
No	58	52.73
Total	110	100.00

Table 25 reveals that 52.73 percent of the practitioners have the opinion that they are not satisfied in the people's awareness about the scope of Ayurvedic treatment. At the same time 47.27 percent of the practitioners responded that they are satisfied in the people's awareness about the scope of Ayurvedic treatment. This reveals that the majority of the Ayurvedic practitioners are not satisfied in the awareness of the people about the scope of Ayurveda.

2.10. Weakness of the Ayurvedic System due to the over Emphasis on Traditional Way of Practice

Table 26

Weakness due to the over Emphasis on Traditional Way of Practice

Weakness	No. of Practitioners	Percentage
Yes	80	72.73
No	30	27.27
Total	110	100.00

Table 26 reveals that 72.73 percent of the practitioners have the opinion that Ayurvedic system has weakness due to its over emphasis on traditional way of practice. But at the same time 27.27 percent of the practitioners responded that there is no such problem in the Ayurvedic system. Hence it can be observed that the majority of the practitioners are of the view that Ayurvedic system has weakness due to its over emphasis on traditional way of practice.

Table 27

Opinion of Different Categories of Practitioners Regarding the Over Emphasis on Traditional Way

Characteristics		Respondent %	Respondent No.	N	Z value
Age	Below 45 years	71.19	42	59	0.390
	Above 45 years	74.51	38	51	
Sex	Male	72.97	54	74	0.082
	Female	72.22	26	36	
Qualification	Degree/Diploma	69.09	38	55	0.856
	Postgraduate	76.36	42	55	
Experience	Below 20 years	73.85	48	65	0.316
	Above 20 years	71.11	32	45	
Area of Specialisation	Specialised	75.68	28	37	0.494
	General	71.23	52	73	

*Significant at 5% level. ** Significant at 1% level

Table 27 shows that 71.19 percent of the practitioners below 45 years and 74.51 percent of the practitioners above 45 years responded that Ayurvedic system has weakness due to over emphasis on traditional way of practice. The Z value (0.390) which is not statistically significant shows that there is no significant difference in the proportions of these categories in this opinion.

The analysis shows that 72.97 percent of the male practitioners and 72.22 percent of the female practitioners responded that Ayurvedic system has some weakness due to over emphasis on traditional way of practice. The Z

value (0.082) which is not significant shows that there is no much difference in the proportions of both these groups.

Table 27 also shows that 69.09 percent of the practitioners with degree/ diploma and 76.36 percent of the postgraduate practitioners have the opinion that Ayurvedic system has some weakness due to over emphasis on traditional way of practice. The Z value (0.856) which is not significant shows that there is no much difference in the proportions of these groups in this opinion.

There are 73.85 percent practitioners having below 20 years of experience and 71.11 percent practitioners having above 20 years of experience with the opinion that Ayurvedic system has some weakness due to over emphasis on traditional way of practice. The Z value (0.316) which is not significant shows that there is no much difference in the proportions of these groups regarding this view.

Table 27 shows that 75.68 percent of the practitioners with specialisation and 71.23 percent of the general practitioners responded that Ayurvedic system has some weakness due to over emphasis on traditional way of practice. Here also the Z value (0.494) is not significant, which shows that there is no much difference in the proportions of these two groups in this opinion.

The analysis of the data shows that the majority of the practitioners in all groups have the opinion that Ayurvedic system has weakness due to the over emphasis on traditional way of practice.

2.11. Ayurveda as a Global Science of Living

Table 28

Expectation about Ayurveda to become Global Science of Living

Will become global science of living	No. of Practitioners	Percentage
Yes	109	99.09
No	1	0.91
Total	110	100.00

Table 28 shows that 99.09 percent of the practitioners opined that Ayurvedic system will become a global science of living. At the same time 0.91 percent of the practitioners has no such opinion. This shows that most of the practitioners have confidence in the system as an alternate system of medicine to cater to the rising needs of the mankind and thereby becoming a global science of living.

2.12. Knowledge on Information Technology of Practitioners

Table 29

Knowledge in Information Technology

Knowledge on IT	No. of Practitioners	Percentage
Yes	94	85.45
No	16	14.55
Total	110	100.00

Table 29 shows that 85.45 percent of the Ayurvedic practitioners have knowledge in information technology. At the same time 14.55 percent practitioners responded that they do not have knowledge in information technology. This shows that the majority of the Ayurvedic practitioners have knowledge in information technology.

Table 30

Distribution of Practitioners with the Knowledge of IT

Characteristics		Respondent %	Respondent No.	N	Z value
Age	Below 45 years	91.53	54	59	1.942
	Above 45 years	78.43	40	51	
Sex	Male	81.08	60	74	1.865
	Female	94.44	34	36	
Qualification	Degree / Diploma	76.36	42	55	2.704 **
	Postgraduate	94.55	52	55	
Experience	Below 20 years	90.77	59	65	1.900
	Above 20 years	77.78	35	45	
Area of Specialisation	Specialised	91.89	34	37	1.363
	General	82.19	60	73	

*Significant at 5% level. ** Significant at 1% level

Table 30 reveals that 91.53 percent of the practitioners who are below 45 years and 78.43 percent of the practitioners who are above 45 years of age have some idea about information technology. The Z value (1.942) shows that there is no much difference in the proportions of the two age groups in the knowledge of IT.

From Table 30 it can be seen that there are 94.44 percent of the female practitioners and 81.08 percent of the male practitioners have some idea about information technology. The Z value (1.865) shows that there is no much difference between the male and female practtitioners in the knowledge on IT. This means that no significant difference exists between the two gender groups.

The analysis shows that 94.55 percent of the postgraduate practitioners and 76 .36 percent of the practitioners with degree / diploma qualification have some idea about information technology. The Z value (2.704) shows the difference between the proportions of the practitioners having idea about information technology in the two-qualification groups. Thus the result indicates that the practitioners who have idea about information technology are more among the postgraduate practitioners.

Table 30 reveals that 90.77 percent of the Ayurvedic practitioners having below 20 years of practising experience and 77.78 percent of the practitioners having above 20 of years of experience have idea about information technology. The Z value (1.900) which is not significant shows that there is no much difference in the proportions of these groups in the knowledge of IT.

Table 30 also shows that 91.89 percent of the specialised practitioners and 82.19 percent of the general practitioner have some idea about information technology. The Z value (1.363) shows that there is no much difference between these two groups in the knowledge in IT. The analysis reveals that the majority of the Ayurvedic practitioners in all the categories have knowledge in IT.

2.13. Use of Information Technology in Ayurvedic Practice

Table 31

Information Technology in Ayurvedic Practice

Use of IT in practice	No. of Practitioners	Percentage
Yes	21	19.09
No	89	80.91
Total	110	100.00

Table 31 shows that 19.09 percent of the practitioners utilise IT in their practice. At the same time 80.91 percent of the practitioners do not use IT in their practice. This reveals that the majority of the Ayurvedic practitioners are not using IT in their practice.

Table 32

Distribution of Practitioners who Utilise IT in the Practice

Characteristics		Respondents		N	Z value
		%	No.		
Age	Below 45 years	23.73	14	59	1.038
	Above 45 years	13.73	7	51	
Sex	Male	14.86	11	74	1.085
	Female	27.78	10	36	
Qualification	Degree / Diploma	9.09	5	55	1.983*
	Postgraduate	29.09	16	55	
Experience	Below 20 years	21.54	14	65	1.420
	Above 20 years	15.56	7	45	
Area of Specialisation	Specialised	29.73	11	37	1.964*
	General	13.70	10	73	

*Significant at 5% level. ** Significant at 1% level

Table 32 shows that 23.73 percent of the practitioners below 45 years and 13.73 percent of the practitioners above 45 years use information technology in their practice. The Z value (1.038) shows that there is no much difference in the percentages of both these groups in this regard.

Table 32 shows that 14.86 percent of the male practitioners and 27.78 percent of the female practitioners use information technology in their practice. The Z value (1.085) shows that there is no much difference between the male and the female practitioners in the case of the use of IT in their practice.

There are 9.09 percent of the practitioners with degree / diploma qualification and 29.09 percent of the practitioners with postgraduate qualification use information technology in their practice. The Z value (1.983) which is significant at 5 percent level shows that the difference in the percentages of practitioners of these qualification groups is significant. This is due to the fact that more qualified practitioners are using IT in their practice.

The study reveals that 21.54 percent of the practitioners with experience below 20 years and 15.56 percent of the practitioners of above twenty years of experience use information technology in their practice for diagnosis and treatment. The Z value (1.420) shows that there is no much difference in the percentages of these two groups and it is not statistically significant.

There are 29.73 percent practitioners with specialisation and 13.70 percent general practitioners who resort to information technology in their practice. The Z value (1.964) shows that there is significant difference between the percentages of these groups in the use of IT at 5 percent level. This reveals that specialised practitioners are using IT more.

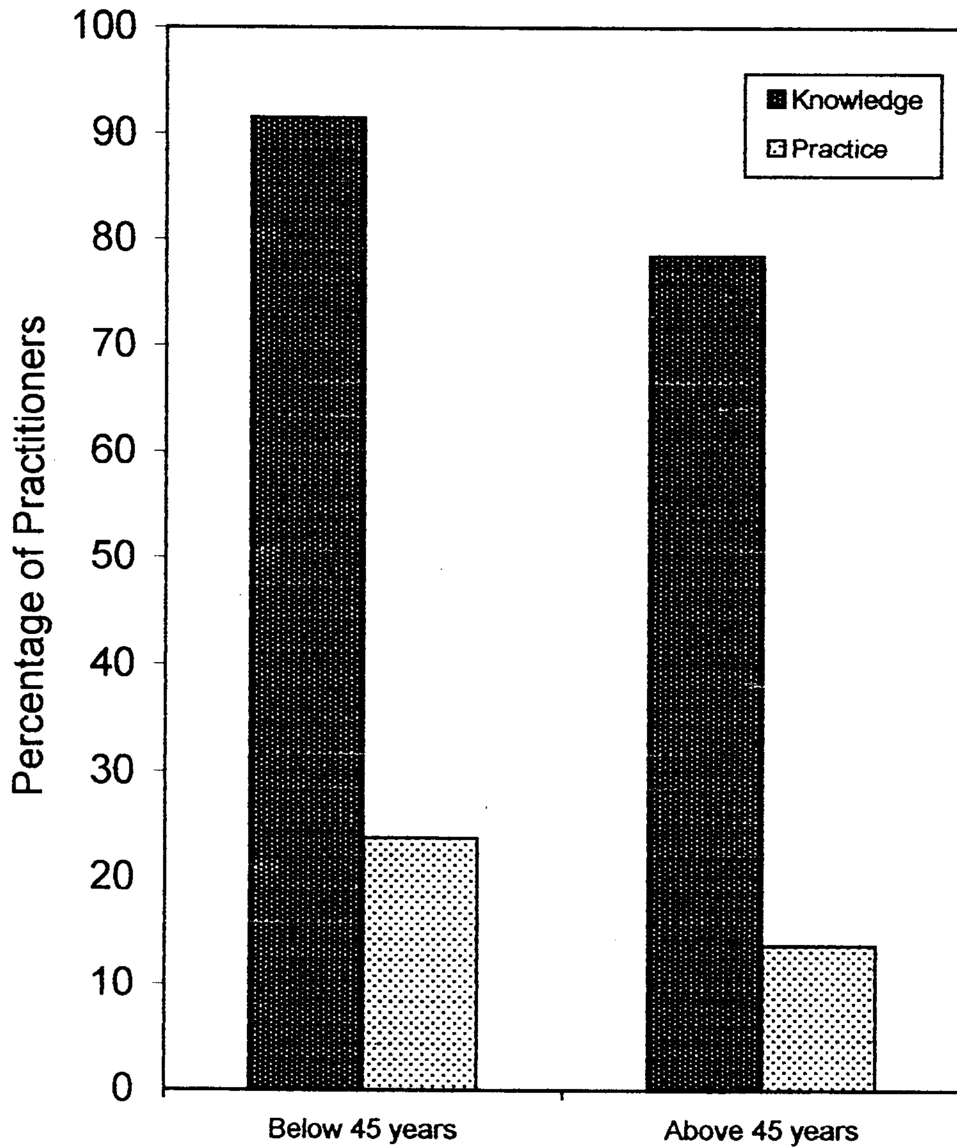
Fig. 3. Knowledge and Practice of IT by Ayurvedic Practitioners with regard to their Age
Percentage of Practitioners
100
90
80
70
60
50
40
30
20
10
0
Knowledge
Practice
Below 45 years
Above 45 years

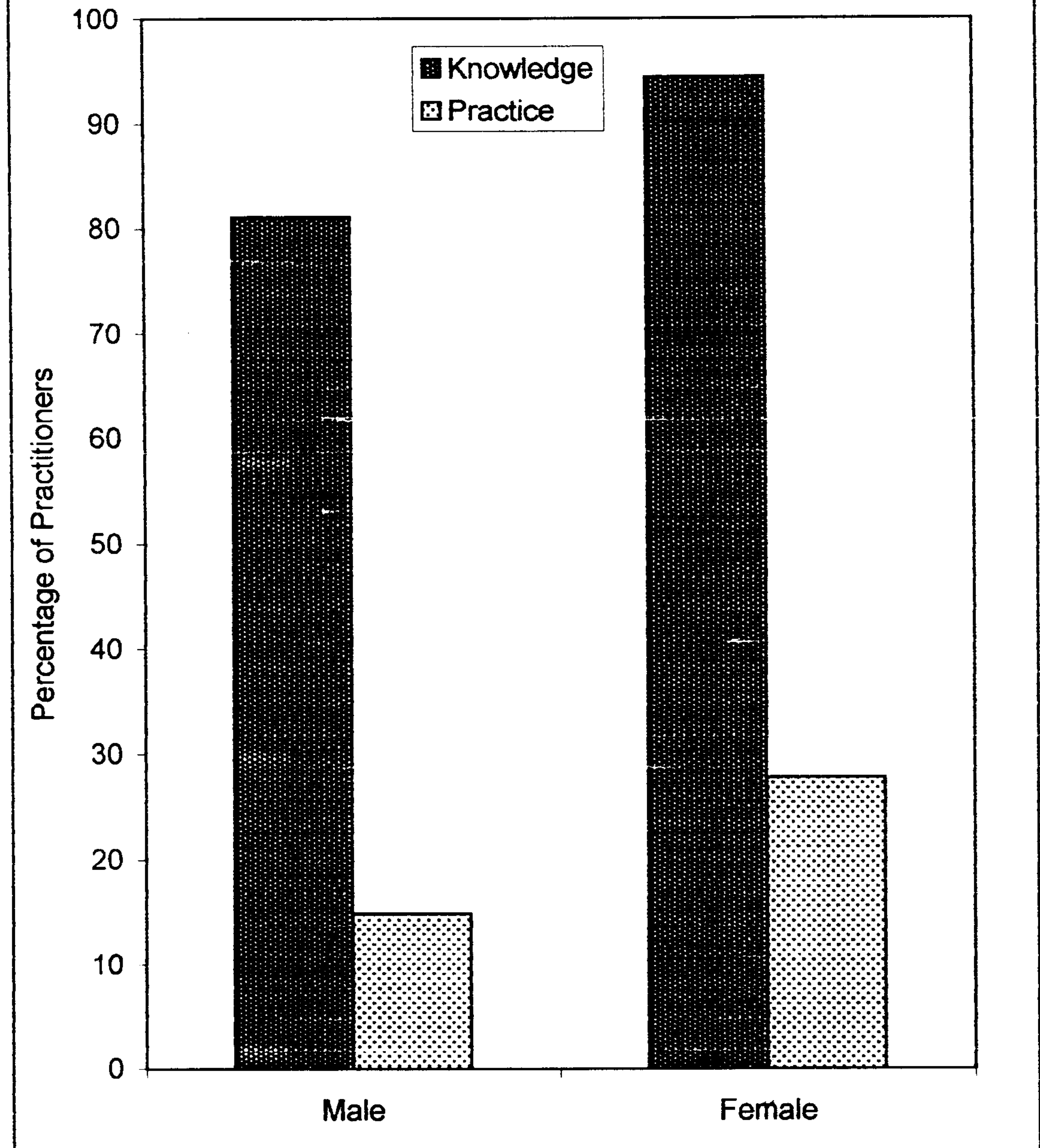
Fig. 4. Knowledge and Practice of IT by Ayurvedic Practitioners with regard to their Sex
Knowledge
Practice
Percentage of Practitioners
100
90
80
70
60
50
40
30
20
10
0
Male
Female

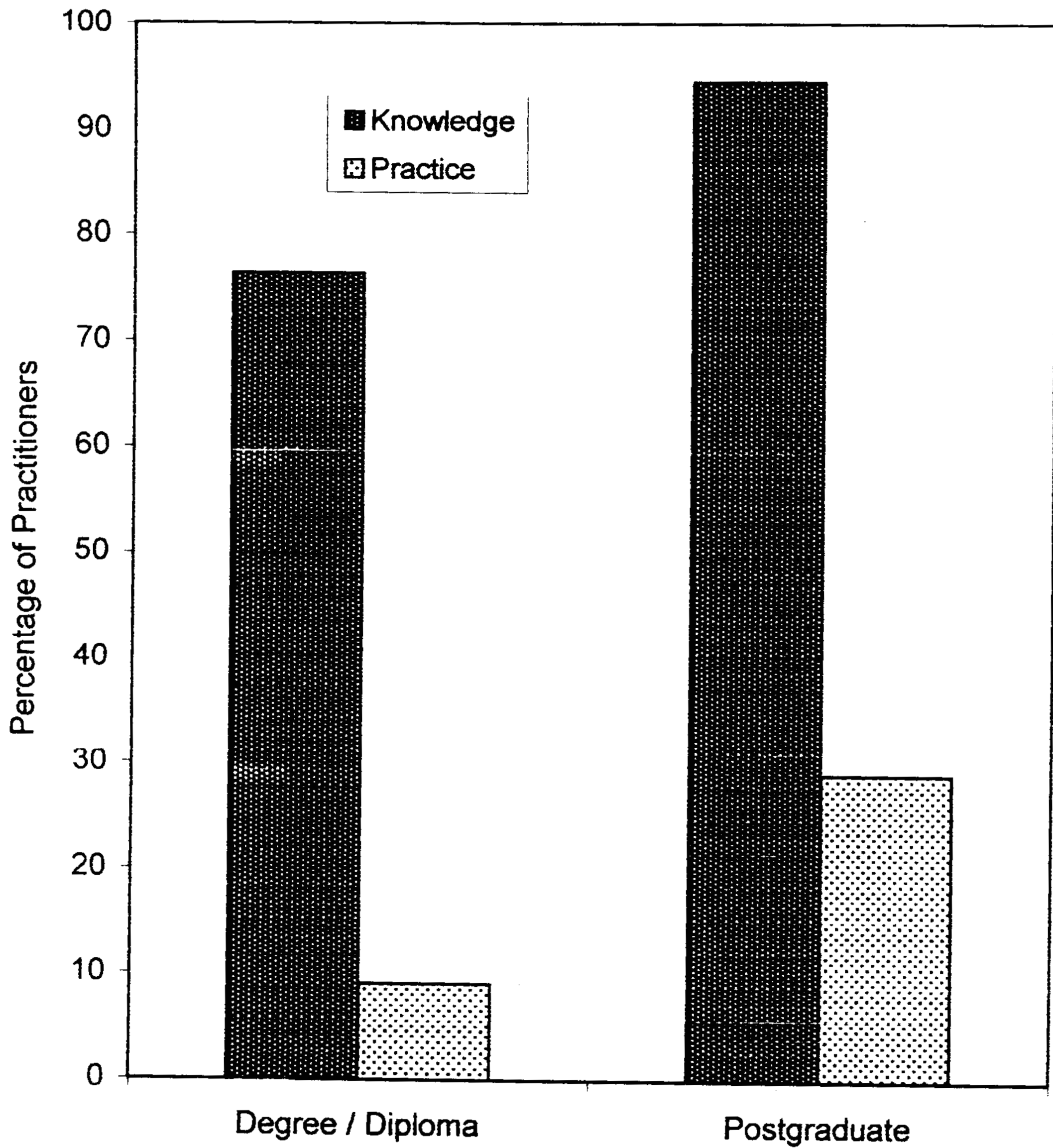
Fig. 5. Knowledge and Practice of IT by Ayurvedic Practitioners with regard to their Qualification
Knowledge
Practice
Percentage of Practitioners
100
90
80
70
60
50
40
30
20
10
0
Degree / Diploma
Postgraduate

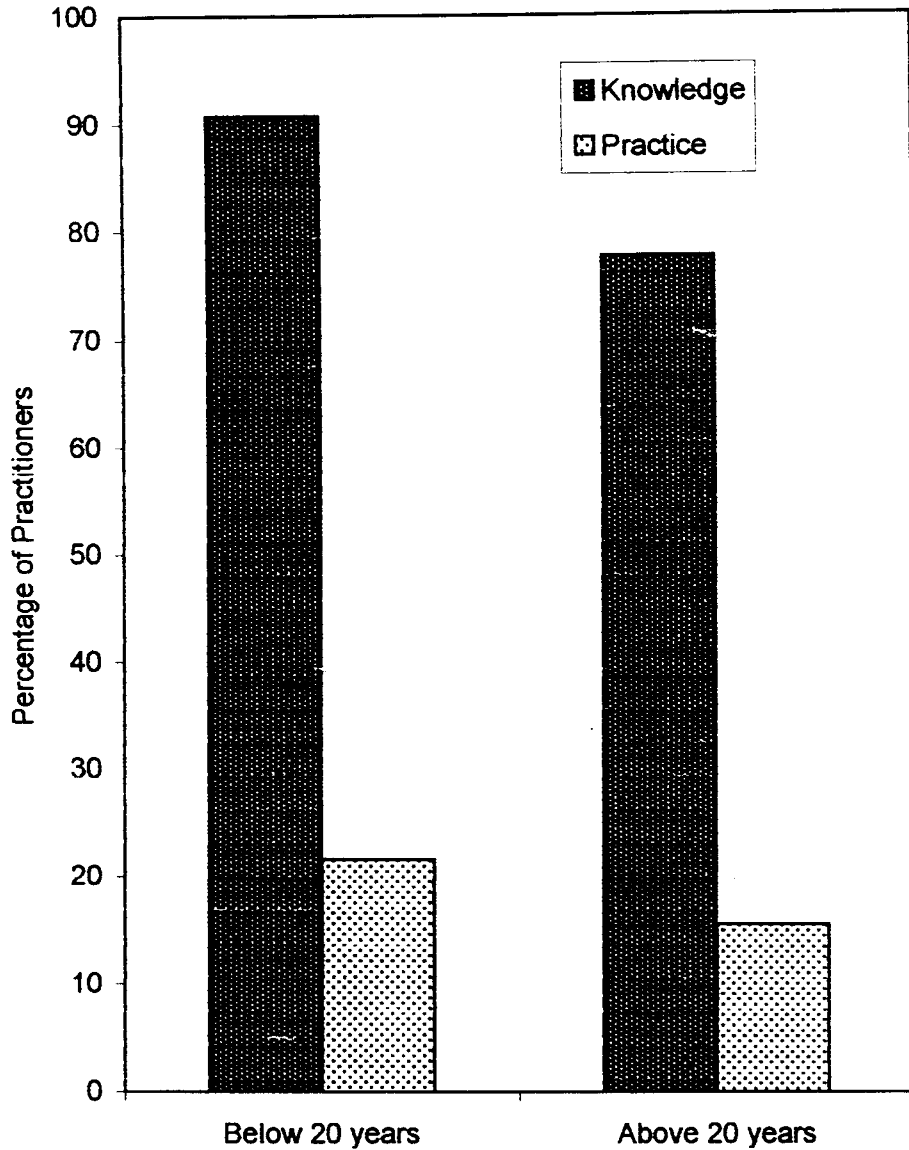
Fig. 6. Knowledge and Practice of IT by Ayurvedic Practitioners with regard to their Experience
Percentage of Practitioners
100
90
80
70
60
50
40
30
20
10
0
Knowledge
Practice
Below 20 years
Above 20 years

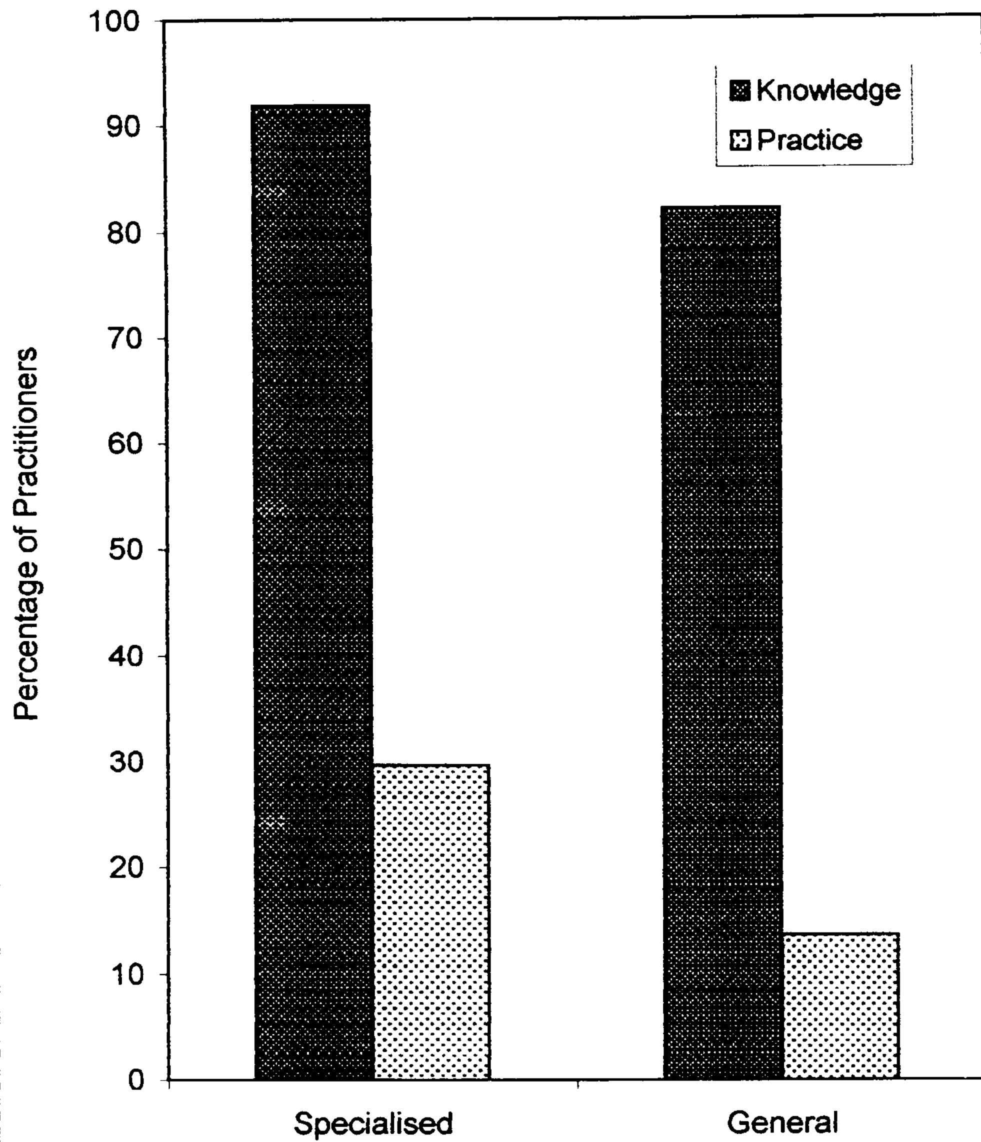
Fig. 7. Knowledge and Practice of IT by Ayurvedic Practitioners with regard to their Area of Specialisation
Percentage of Practitioners
100
90
80
70
60
50
40
30
20
10
0
Knowledge
Practice
Specialised
General

2.14. Future Plan for Using Information Technology in Practice

Table 33

Future Plan for using IT

Future Plan for use of IT	No. of Practitioners	Percentage
Yes	77	70.00
No	33	30.00
Total	110	100.00

Table 33 shows that 70 percent of the Ayurvedic Practitioners have future plan for using IT in their practice. At the same time 30 percent of the practitioners do not have future plan for using IT in their practice. This shows that the majority of the Ayurvedic practitioners have future plan for using IT in their practice.

Table 34

Distribution of Practitioners who have Future Plan for Using IT

Characteristics		Respondent		N	Z value
		%	No.		
Age	Below 45 years	71.19	42	59	1.051
	Above 45 Years	68.63	35	51	
Sex	Male	70.27	52	74	0.035
	Female	69.44	25	36	
Qualification	Degree / Diploma	80.00	44	55	1.974*
	Postgraduate	60.00	33	55	
Experience	Below 20 years	73.85	48	65	1.051
	Above 20 years	64.44	29	45	
Specialisation	Specialised	67.57	25	37	0.071
	General	71.23	52	73	

*Significant at 5% level. ** Significant at 1% level

Table 34 shows that 71.19 percent of the practitioners of age below 45 years and 68.63 percent of the practitioners above 45 years have future plan for using information technology in their practice. The Z value (1.051) which is not significant shows that there is no much difference between the percentages of two age groups in this regard.

There are 70.27 percent male practitioners and 69.44 percent female practitioners who have future plan for using information technology in their

practice. The Z value (0.035) shows that there is no much difference in the percentages of these two gender groups.

Table 34 shows that 80 percent of the practitioners of degree/diploma qualification and 60 percent of the practitioners with postgraduate qualification have future plan for utilising information technology for their practice. The Z value (1.974) which is significant shows that the difference between the percentages of the two qualification groups is large and statistically significant at 5 percent level.

There are 73.85 percent practitioners having experience below 20 years and 64.44 percent practitioners having experience more than 20 years who have future plan for using information technology in their practice. The Z value (1.051) shows that the difference between the percentages of the two experience groups is not statistically significant.

Table 34 shows that 67.57 percent of the Ayurvedic practitioners with specialisation and 71.23 percent of the general practitioners have future plan for using information technology in their practice. The Z value (0.071) shows that the difference between the percentages of these two groups is not statistically significant. The result shows that the majority of Ayurvedic practitioners in all groups have future plan for using IT in their practice.

3. Attitude of Practitioners towards Information Technology

The attitude of Ayurvedic practitioners towards information technology includes the effectiveness of documentation, Internet connection, Website hosting, online treatment and computer aided diagnosis in their daily practice.

3.1. The Effectiveness of Computerised Documentation

Table 35 shows that 70 percent of the Ayurvedic practitioners responded that the effectiveness of computerised documentation is normal and 24.54

percent of the practitioners opined that it is effective. Only 2.73 percent of the practitioners responded that it is very effective. At the same time another 2.73 per cent of the practitioners opined that it is poor.

Table 35

The Effectiveness of Documentation among Practitioners

Effectiveness	No. of practitioners	Percentage
Very effective	3	2.73
Effective	27	24.54
Normal	77	70.00
Poor	3	2.73
Total	110	100.00

3.2. Availability of Internet Connection

Table 36

Availability of Internet Connection

Internet Connection is available	No. of Practitioners	Percentage
Yes	88	80.00
No	22	20.00
Total	110	100.00

Table 36 shows that 80 percent of the practitioners have Internet connection at home / place of practice. At the same time 20 percent of the practitioners do not have Internet connection.

3.3. Web sites on Internet

Table 37

Availability of Web Sites

Web Sites Available	No. of Practitioners	Percentage
Yes	24	21.82
No	86	78.18
Total	110	100.00

Table 37 shows that 21.82 percent of the practitioners have their own web sites on Internet. The majority of the Ayurvedic practitioners (78.18 percent) do not have web site on Internet.

3.4. Scope for Online Treatment

Table 38

Online Treatment

Scope for Online treatment	No. of Practitioners	Percentage
Yes	88	80.00
No	22	20.00
Total	110	100.00

Table 38 shows that 80 percent of the Ayurvedic practitioners have the opinion that there is scope for online treatment for Ayurveda. But 20 percent of the practitioners opined that there is no scope for online treatment. Hence, it can be seen that the majority of the practitioners have the opinion that there is scope of online treatment in Ayurveda.

Table 39

Distribution of practitioners on the scope for online treatment

Characteristics		Respondent		N	Z value
		%	No.		
Age	Below 45 years	84.75	50	59	1.338
	Above 45 years	74.51	38	51	
Sex	Male	78.38	58	74	0.609
	Female	83.33	30	36	
Qualification	Degree / Diploma	74.55	41	55	1.430
	Postgraduate	85.45	47	55	
Experience	Below 20 years	86.15	56	65	1.839
	Above 20 years	71.11	32	45	
Area of Specialisation	Specialised	83.78	31	37	0.706
	General	78.08	57	73	

*Significant at 5% level. ** Significant at 1% level

Table 39 shows that 84.75 percent of the practitioners below 45 years and 74.51 percent of the practitioners above 45 years agree that Ayurvedic system has scope for online treatment. The Z value (1.338) shows that there is no much difference in the proportions of the percentages of these two age groups in this opinion and is not statistically significant.

There are 83.33 percent female practitioners and 78.38 percent male practitioners who have the opinion that Ayurvedic treatment has scope for online treatment. The Z value (0.609) shows that there is no much difference in the proportions of the percentages of these groups in this opinion and it not statistically significant.

Table 39 also shows that 85.45 percent of the postgraduate Ayurvedic practitioners and 74.55 percent of the practitioners with degree/diploma opined that Ayurvedic system has scope for on line treatment. The Z value (1.430) shows that there is no much difference in the proportions of the percentages of these groups in this opinion and it not statistically significant.

It can also be seen from Table 39 that 86.15 percent of the practitioners who have below 20 years of experience and 71.11 percent of the practitioners who have above 20 years of experience responded that Ayurvedic system has scope for on line treatment. The Z value (1.839) shows that there is no much difference in the proportions of the percentages of these two experience groups in this opinion and is not and statistically significant.

The analysed data also show that 83.78 percent of the specialised practitioners and 78.08 percent of the general practitioners have the opinion that Ayurvedic system has scope for online treatment. The Z value (0.706) shows that there is no much difference between the proportions of the percentages of these two groups in this opinion and is not statistically significant. The analysis reveals that the majority of the Ayurvedic practitioners in all groups believe that there is scope for online treatment in Ayurveda.

3.5. Attitude Towards Computer Aided Diagnosis and Treatment

Table 40

Computer Aided Diagnosis and Treatment

Computer Aided Diagnosis	No. of Practitioners	Percentage
In favour	79	71.82
Against	31	28.18
Total	110	100.00

Table 40 shows that 71.82 percent of the practitioners responded that they are in favour of computer aided diagnosis and treatment. However 28.18 percent of the practitioners are not in favour of computer aided diagnosis and treatment. This shows that the majority of the practitioners are in favour of computer aided diagnosis and treatment.

Table 41

Distribution of Practitioners who are in favour of Computer Aided Diagnosis and Treatment

Characteristics		Respondent		N	Z value
		%	No.		
Age	Below 45 years	81.36	48	59	2.392*
	Above 45 years	60.78	31	51	
Sex	Male	68.92	51	74	0.969
	Female	77.78	28	36	
Qualification	Degree / Diploma	54.55	30	55	4.027**
	Postgraduate	89.09	49	55	
Experience	Below 20 years	75.38	49	65	0.999
	Above 20 years	66.67	30	45	
Area of Specialisation	Specialised	83.78	31	37	1.986*
	General	65.75	48	73	

*Significant at 5% level. ** Significant at 1% level

Table 41 shows that 81.36 percent of the Ayurvedic practitioners below 45 years of age and 60.78 percent of the practitioners above 45 years are in favour of computer aided diagnosis and treatment. The Z value (2.392) shows that the difference between the proportions of these two age groups is large

and statistically significant. The result indicates that younger practitioners are more in favour of computer-aided diagnosis and treatment.

The analysis shows that 68.92 percent of the male practitioners and 77.78 percent of the female practitioners are in favour of computer aided diagnosis and treatment. The Z value (0.969) shows that there is no much difference in the proportions of the percentages of two gender groups and is not statistically significant.

Table 41 also shows that 89.09 percent of the Ayurvedic practitioners with post graduation and 54.55 percent of the practitioners with degree / diploma are in favour of computer aided diagnosis and treatment. The Z value (4.027) shows that there is much difference in the percentages of two qualification groups and is statistically significant . The analysis reveals that those who have post graduation are more in favour of computer aided diagnosis and treatment.

There are 75.38 percent practitioners below 20 years of experience and 66.67 percent practitioners above 20 years of experience who are in favour of computer-aided diagnosis and treatment. The Z value (0.999) shows that there is no much difference in the percentages of these two groups and is not statistically significant.

Table 41 shows that 83.78 percent of the practitioners with specialisation and 65.75 percent of the general practitioner are in favour of computer-aided diagnosis and treatment. The Z value (1.986) shows that the difference between the proportions of the percentages of the practitioners in two groups is statistically significant. The result thus indicates that specialised Ayurvedic practitioners are more in favour of computer-aided diagnosis and treatment.

4. Information Technology and Efficiency of Practitioners

Table 42

IT and Efficiency of Practitioners

IT and Efficiency of practice	No. of practitioners	Percentage
Yes	15	13.64
No	95	86.36
Total	110	100.00

Table 42 shows that 13.64 percent of the practitioners responded that use of information technology in practice will increase the efficiency of Ayurvedic practitioners in diagnosis and treatment. At the same time 86.36 percent of the practitioners have the opinion that information technology will not increase the efficiency of Ayurvedic practitioners.

Table 43

Distribution of Practitioners with regard to the Approach towards IT

Characteristics		Respondent		N	Z value
		%	No		
Age	Below 45 years	6.78	4	59	2.254*
	Above 45 years	21.57	11	51	
Sex	Male	17.57	13	74	1.723
	Female	5.56	2	36	
Qualification	Degree / Diploma	21.82	12	55	2.501*
	Postgraduate	5.45	3	55	
Experience	Below 20 years	7.69	5	65	2.183*
	Above 20 years	22.22	10	45	
Area of Specialisation	Specialised	5.41	2	37	0.791
	General	17.81	13	73	

*Significant at 5% level. ** Significant at 1% level

Table 43 shows that 21.57 percent of the practitioners who have above 45 years and 6.78 percent of the practitioners who have below 45 years believe that information technology will increase their efficiency. The Z value (2.254) shows that the difference between the proportions of the practitioners of these age groups is statistically significant. Comparing to the youngsters, seniors are more in this belief.

The analysis shows that 17.57 percent of the male practitioners and 5.56 percent of the female practitioners have the opinion that information technology will increase the efficiency of their practice. The Z value (1.723) shows that there is no much difference in the proportions of the percentages

of these two gender groups of practitioners and the difference is not statistically significant.

Table 43 shows that 21.82 percent of the practitioners with degree / diploma and 5.45 percent of the postgraduate practitioners have the opinion that information technology will increase the efficiency in practice. The Z value (2.501) shows that the difference between the proportions of the practitioners in these two qualification groups is large and statistically significant. The analysis reveals that practitioners with lesser qulification are more in this belief.

There are 22.22 percent practitioners with above 20 years of experience and 7.69 percent practitioners having below 20 years of experience with the opinion that use of information technology will increase the efficiency of Ayurvedic practice. The Z value (2.183) shows that the difference between the proportions of the practitioners of these two groups is statistically significant. Thus it can be observed that more experienced practitioners are more in this belief.

Table 43 shows that 17.81 percent of the general practitioners and 5.41 percent of the specialised practitioners believe that use of information technology will increase the efficiency of practitioners in the diagnosis and treatment. The Z value (0.791), which is not significant, shows that there is no much difference in the percentages of these two groups in this belief.

5. Research and Development in Ayurvedic Medicine

Table 44

Level of Research and Development According to Practitioners

Level of R&D	No. of practitioners	Percentage
Low	106	96.36
Very low	3	2.73
Equal	1	0.91
Total	110	100.00

Table 44 shows that 96.36 percent of the Ayurvedic practitioners are of the opinion that research and development in Ayurvedic medicine is low when compared to modern Allopathy medicine. At the same time 2.73 percent of the practitioners have the opinion that it is very low when compared to modern Allopathy medicine. Only 0.91 percent of the practitioners believe that research and development in Ayurvedic medicine is equal. Thus, it can be observed that the majority of the practitioners have the opinion that research and development is low in Ayurvedic treatment.

6. Manufacturing of Ayurvedic Drugs

In the present study the data from the Ayurvedic drug producers are analysed to learn the existing trend of manufacturing of medicine and explore the possibilities of application of IT.

6.1. Profile of the Manufacturers

In Kerala there are more than 900 licensed drugs manufacturing firms. A sample of 50 licensed drug producers from three regions of the state is selected for this study. The data were collected through structured questionnaire from

fifty manufacturing firms of large, medium and small scale. The size of the firm is determined by the volume of drugs produced in a year. The large scale firms are those which produce drugs worth Rupees 2 crores and above in a year. Medium scale producers are those firms which produce drugs worth Rupees 50 lakhs to 2 cores annually. Small scale firms are those which produce drugs worth rupees 5 lakhs to 50 lakhs in a year.

Table 45

Size of the firms

Size of firms	Firms	Percentage
Large	3	6.00
Medium	27	54.00
Small	20	40.00
Total	50	100.00

Table 45 shows that in the sample there are 54 percent medium scale drug production firms, 40 percent small-scale firms and 6 percent large scale manufacturing firms. For the convenience of analysis, the large and medium firms (3+27= 30) are taken together. Therefore total percentage of large and medium firms together is 60 percent.

6.2. Qualification of the Licensees

The manufacturing firms require license from the state drug controller. In order to obtain license, qualified Ayurvedic practitioners are needed for supervision while producing the preparations. Therefore their qualification is also studied.

Table 46

Qualification of the Licensees

Qualification	Number	Percentage
BAM/ BAMS	34	68.00
DAM	11	22.00
PG	5	10.00
Total	50	100.00

Table 46 shows that 68 percent of the licensees have BAM / BAMS qualification. At the same time 22 percent of the licensees have diploma (DAM) and 10 percent of the licensees have postgraduate degree. The majority of the licensees are BAM/ BAMS degree holders.

Table 47

Specialisation of Drug Production

Specialisation of Drugs	Firms	Percentage
General Drugs	50	100.00
Total	50	100.00

Table 47 shows the type of drug production among the manufacturing firms. All the 50 manufacturers responded that they are producing general Ayurvedic drugs.

6.3. Professional Variables

Table 48

Licensees Working as Technical Staff at their Firm

Licensees as Technical Staff	Number of firms	Percentage
Yes	23	46.00
No	27	54.00
Total	50	100.00

In some of the manufacturing firms, the licensees are working as technical person to supervise the drug preparations. Table 48 shows that 46 percent of the licensees are working as technical staff in their firms. At the same time the majority (54 percent) of the licensees are not working as technical staff in drug preparations.

Table 49

Distribution of Technical Staff for
Drug Production According the Size of the Firms

Qualification	Large & Medium firms		Small firms		Total firms		Z value
	No.	%	No	%	No.	%	
BAM/BAMS	28	93.34	16	80.00	44	88.00	1.865
DAM	2	6.66	4	20.00	6	12.00	1.792
Total	30	100.00	20	100.00	50	100.00	

Table 49 shows that the technical staff of 93.34 percent firms of large and medium type have BAM and BAMS qualification. At the same time 80

percent of the small firms have technical staff with BAM/BAMS qualification. The Z value (1.865) shows that the difference in the percentages of the two groups of firms is not so large and statistically not significant.

There are 6.66 percent firms of large and medium type which have technical staff for drugs production with diploma qualification. At the same time 20 percent of the small firms have technical staff with diploma. The Z value (1.792) shows that the difference in the percentages of the two groups of firms is not so large and statistically not significant.

6.4. Technical Staff for Quality Control

Table 50

Technical Staff for Quality Control

Technical Staff for quality control	Firms	Percentage
Yes	50	100.00
No	0	0.00
Total	50	100.00

Table 50 shows that cent percent manufacturing firms have technical staff for quality control of drugs.

Table 51

Qualification of Technical staff for Quality Control

Qualification	Firms	Percentage
BAM / BAMS	29	58.00
DAM	10	20.00
B.Pham	4	8.00
D.Pham	7	14.00
Total	50	100.00

Table 51 shows that 58 percent of the firms have technical staff for quality control with qualification like BAM and BAMS. While 20 percent of the firms have Diploma holders for quality control. Only 8 percent of the firms have technical staff with degree in pharmaceutical science (B.Pham) and 14 percent of the firms have technical staff with D Pham, for quality control. It can be observed from Table 51 that the majority of the firms have BAM/ BAMS degree holders for quality control.

Table 52

Qualification of Technical Staff for Quality Control
According to the Size of the Firms

Qualifications	Large & Medium firms		Small firms		Z value
	No.	%	No.	%	
BAM/BAMS	22	73.33	7	35.00	2.218*
DAM	3	10.00	7	35.00	2.015*
B. Pham	3	10.00	1	5.00	1.658
D.Pham	2	6.66	5	25.00	1.967*
Total	30	100.00	20	100.00	

*Significant at 5% level. ** Significant at 1% level

Table 52 shows that in 73.33 percent of the large and medium firms and 35 percent of the small firms, the technical staff for quality control of drugs have degree qualification like BAM / BAMS. The Z value (2.218) shows that there is much difference in the proportions of the percentages of the technical staff with BAM / BAMS for quality control in two groups of firms and it is statistically significant at 5 percent level. This shows that large and medium size firms appoint more BAM/BAMS degree holders as technical staff.

At the same time 10 percent of the large and medium firms and 35 percent of the small firms have technical staff with diploma, for quality control. The Z value (2.015) shows that there is much difference in the proportions of the percentages of the technical staff for quality control in two groups of firms and the difference is statistically significant at 5 percent level. Among the large and medium scale firms 10 percent have technical staff for quality control with B.Pham and 5 percent of the small firms have B.Pham degree for quality control. The Z value (1.658) shows that there is no much difference in the percentages of the B.Pharm holders in both these types of firms as technical staff for quality control.

The table shows that 6.66 percent of the large and medium scale firms and 25 percent of the small firms have technical staff with D.Pham for quality control. The Z value (1.967) shows that there is much difference in the proportions of the percentages of technical staff for quality control of these two groups of firms and the difference is statistically significant at 5 percent level. The overall analysis shows that large and medium firms appoint more qualified persons as their technical staff for quality control.

6.5. Technical Staff for Marketing

Table 53

Technical Staff for Marketing

Technical Staff For marketing	Firms	Percentage
Yes	50	100.00
No	0	0.00
Total	50	100.00

Table 53 shows that cent percent firms have technical staff for marketing Ayurvedic medicines.

Table 54

Qualification of Staff for Marketing of Drugs

Qualifications	Firms	Percentage
BA/BSc/BCom	20	40.00
BAM/BAMS/ DAM	5	10.00
MBA	4	8.00
Pre Degree	8	16.00
SSLC	13	26.00
Total	50	100.00

Table 54 shows that there are 10 percent firms which have BAM/BAMS/DAM holders as marketing personnel and 8 percent firms have MBA degree holders for this purpose. Among the firms 40 percent have BA/BSc/Bcom degree holders as marketing personnel. There are 16 percent with Pre Degree holders and 26 percent with SSLC holders as marketing staff.

Table 55

Distribution of the Qualification of the Technical Staff for Marketing

Qualification	Large & Medium firms		Small firms		Z-value
	No.	%	No.	%	
BA/BSc/Bcom	15	50.00	5	27.00	1.985*
BAM/BAMS/ DAM	3	10.00	2	10.00	-
MBA	4	13.33	0	0.00	-
Pre Degree	5	16.67	3	15.00	0.0124
SSLC	3	10.00	10	48.00	2.127*
Total	30	100.00	20	100.00	

*Significant at 5% level. ** Significant at 1% level

Table 55 shows that 50 percent of the firms of large and medium type and 27 percent of the small firms have BA/BSc/BCom degree holders as their marketing personnel. The Z value (1.985) which is significant at 5 percent level shows that large /medium firms and small firms differ much in the appointment of degree holders as their marketing staff. The analysis reveals that large and medium firms appoint degree holders more as compared to small firms.

It can also be seen from Table 55 that 10 percent of the large and medium type firms and 10 percent of the small firms have BAM/BAMS/DAM holders for their marketing staff. The Z value cannot be calculated because there is no difference in the percentages

Table 55 shows that 13.33 percent of the medium and large firms have MBA holders as their marketing staff and there is no small firm which has marketing staff with MBA qualification. In this case the Z value cannot be calculated as only one group is available.

Table 55 shows that 16.67 percent of the large and medium firms and 15 percent of the small firms have marketing staff with Pre Degree qualification. The Z value (0.0124) which is not significant shows that there is no much difference in the percentages of the type of firms with Pre-degree holders as marketing staff.

It can also be seen that 48 percent of the small firms and 10 percent of the large and medium firms have marketing staff with SSLC qualification. The Z value (2.127) which is significant at 5 percent level shows that there is much difference in the proportions of the percentages of firms in two groups in this case. The percentages shows that small firms are appointing SSLC holders more as marketing staff as compared to large and medium firms.

6.6. Preparation of Patented Drugs

Table 56

Preparation of Patented Drugs

Preparation of patented drugs	Firms	Percentage
Yes	16	32.00
No	34	68.00
Total	50	100.00

Table 56 shows that 32 percent of the firms produce patented drugs . At the same time the majority of the firms (68 percent) do not produce patented drugs.

Table 57

Distribution of Preparation Patented Drugs according to the Size of the Firms

Large & Medium firms		Small firms		Z-value
No.	%	No.	%	
14	46.66	2	10.00	2.723**

*Significant at 5% level. ** Significant at 1% level

Table 57 shows that 46.66 percent of the large and medium firms produce patented drugs. At the same time 10 percent of the firms of small type produce patent drugs. The difference between the proportion of the two manufacturing groups in the case of the preparation of patented drugs is so large and significant as indicated by the Z value (2.723). It can be seen that large and medium firms are preparing patented drugs more.

6.7. Type of Drug Production

Table 58

Types of Drugs Produced

Type of Drugs	Firms	Percentage
Herbal Drugs	50	100.00
Metallic- Mineral	16	32.00
Herbo – Mineral	11	22.00

Table 58 shows that 100 percent firms produce herbal drugs, 32 percent firms produce metallic -mineral drugs and 22 percent firms produce herbo - mineral drugs. Hence, herbal drugs are the most common products of all firms.

Table 59

Distribution of the Type of Drug Production

Type	Large & Medium firms		Small firms		Z-value
	No.	%	No.	%	
Herbal Drug	30	100.00	20	100.00	-
Metallic-Mineral	9	30.00	7	35.00	0.371
Herbo – Mineral	9	30.00	2	10.00	1.672

Table 59 shows that cent percent of the large and medium type as well as small firms produce herbal drugs. As both percentages levels are same Z value is not calculated . There are 30 percent large and medium type firms and 35 percent small firms which produce metallic-mineral drugs. The Z

value (0.371) shows that there is no significant difference between them. This indicates that the size of the firms is not a criteria for producing metallic – mineral drugs

There are 30 percent large and medium scale firms and 10 percent small firms which produce herbo-mineral drugs. The Z value (1.672) shows that there is no significant difference between the type of firms in the production of herbo-mineral drugs.

6.8. Type of Method Used for Drug Production

Table 60

Type of Method Used for Drug Production

Method used	Firms	Percentage
Mixed	27	54.00
Modern	5	10.00
Traditional	18	36.00
Total	50	100.00

Table 60 shows that 54 percent of the firms follow mixed way of drug preparation that is by combining both traditional and modern ways. At the same time 10 percent of the firms use modern technology with latest equipment like dish pan, drug boilers and process vessels, electric furnace, drying oven, tray drier, steam generator, fermentation vessels and distillation plant and storage vessels for drugs preparation. Traditional way of drug preparation is used by 36 percent of the firms. Thus, it can be observed that the majority of the firms are using mixed way of manufacturing Ayurvedic medicine.

Table 61

Type of Method used for Drug Production in different Type of Firms

Method used	Large & Medium firms		Small firms		Z-value
	No.	%	No.	%	
Mixed	19	63.33	8	40.00	2.146*
Modern	1	3.33	4	20.00	1.952
Traditional	10	33.33	8	40.00	1.421
Total	30	100	20	100.00	

*Significant at 5% level. ** Significant at 1% level

Table 61 shows that 63.33 percent of the large and medium firms and 40 percent of the small firms resort to mixed way for drug production. The mixed way of production means the firms utilises both traditional and modern methods for drug production. The Z value (2.146) which is significant shows that there exists significant difference between the proportions of the percentages of two groups of firms. This shows that mixed way of drug production is used more by large and medium size firms.

It can also be seen that 3.33 percent of the large and medium firms and 20 percent of the small firms resort to modern method for drug production. The Z value (1.952) shows that the difference between the proportions of the percentage of two groups of firms which resort to modern method of drug production is not so large and not significant.

Table 61 also shows that 33.33 percent of the large and medium firms and 40 percent of the small firms depend on traditional way of drug production. The Z value (1.421) shows that the difference between the proportions of the percentages of the two groups of firms are not so large and

not significant. This shows that irrespective of their size, the firms continue the traditional method for drug production.

6.9. Keeping the Accounts of Ayurvedic Products

Table 62

The accounts of the products

Keeping the accounts	Firms	Percentage
Yes	49	98.00
No	1	2.00
Total	50	100.00

Table 62 shows that 98 percent of the firms keep the accounts related to the processing and distribution of Ayurvedic products. At the same time 2 percent firms do not keep the accounts .This shows that great majority of the firms keep accounts related to processing and distribution of Ayurvedic products.

Table 63

Way of Keeping of Accounts of Ayurvedic Products

Mode of keeping	Firms	Percentage
Register	39	78.00
Computers	10	20.00
Bills/Vouchers	1	2.00
Total	50	100.00

Table 63 shows that 78 percent of the manufacturing firms keep the accounts in registers. Only 20 percent of the firms keep their accounts related

to processing and distribution of Ayurvedic drugs in computer. Bills /Vouchers are used for keeping accounts by 2 percent of the firms.

6.10. Ayurvedic Pharmacopoeia

Table 64

Use of Ayurvedic Pharmacopoeia

Follow Pharmacopoeia	Firms	Percentage
Yes	50	100.00
No	0	0.00
Total	50	100.00

Table 64 shows that all the firms are following Ayurvedic pharmacopoeia in drug preparation.

6.11. Good Manufacturing Practice (GMP)

The "Good Manufacturing Practice" is used internationally to describe a set of principles and procedures which when followed by manufacturers of therapeutic goods, helps to ensure that the products manufactured will have the required quality.

Table 65

Present Status of Good Manufacturing Practice

Poses GMP	Firms	Percentage
Yes	12	24.00
No	38	76.00
Total	50	100.00

Table 65 shows that 76 percent of the firms do not have Good Manufacturing Practice Certificate for drug preparation . Only 24 percent of the firms have GMP certificate for the production of drugs in Kerala. The GMP enables the firms to produce quality drugs to export to foreign countries.

Table 66

Distribution of GMP according to the Size of the Firms

Large & Medium		Small Firms		Z-value
No.	%	No.	%	
9	30.00	3	15.00	1.963*

*Significant at 5% level. ** Significant at 1% level

Table 66 shows that 30 percent of the large and medium type firms have GMP certificate and 15 percent of the small type firms obtained Good Manufacturing Practice certification for drug production. The Z value (1.963) shows that the difference between the proportions of the percentages of two groups of firms having GMP certificate is so large and significant at 5 percent level. This indicates that more large and medium firms have GMP certificate compared to the small firms.

6.12. Equipment for Drug Preparation

Table 67

Use of Modern Equipment

Use of Equipment	Firms	Percentage
Yes	37	74.00
No	13	26.00
Total	50	100.00

Table 67 shows that 74 percent of the firms are using modern equipment for drugs preparation. At the same time 26 percent of the firms do not use modern equipment and are resorting to the conventional way for drug production.

6.13. Updating with the Developments of Drug Production

Table 68

Mode of Updating the Developments

Materials	Firms	Percentage
Books	47	94.00
Journals	30	60.00
Internet	5	10.00
Patents	16	32.00
Seminars	14	28.00

Table 68 shows that 94 percent of the firms depend on books for the latest information for updating with the developments in the drug production. The journals are used by 60 percent of the firms for updating. At the same time 10 percent of the firms use Internet for knowing the latest developments. Among the firms 32 percent firms use patents for the information. Only 28 percent firms update the latest developments in manufacturing drugs through seminars and conferences.

6.14. Medicinal Plants for Drug Preparation

Table 69

Growing of Medicinal Plants

Growing Medicinal Plants	Firms	Percentage
Yes	40	80.00
No	10	20.00
Total	50	100.00

Table 69 shows that 80 percent of the firms grow medicinal plants for drugs preparation. There are 20 percent firms which do not grow medicinal plants for drug production. This shows that the majority of the firms grow medicinal plants.

6.15. Awareness of the People on Ayurvedic Products

Table 70

Awareness of the Ayurvedic products

Aware	Number	Percentage
Yes	32	64.00
No	18	36.00
Total	50	100.00

Table 70 shows that 64 percent firms expressed their opinion that they are satisfied with the people's awareness of the scope of Ayurvedic products. At the same time 36 percent of the firms responded that they are not satisfied with the people's awareness of the scope of Ayurvedic products. This shows

that the majority of the firms are satisfied with the people's knowledge in Ayurvedic products.

6.16. Quality of Medicines of Different Firms

Table 71

Quality of Medicines of Different Firms

Quality of medicine	Firms	Percentage
No	50	100.00
Yes	0	0.00
Total	50	100.00

Table 71 shows that cent percent of the firms have the opinion that the quality of same medicines of different firms is not the same. This shows that the Ayurvedic firms do not have uniformity in the pharmacopoeia in drug preparation.

6.17. Standardisation of Drugs

Table 72

Standardisation of drugs

Standardisation of drugs	Firms	Percentage
Yes	50	100.00
No	0	0.00
Total	50	100.00

Table 72 shows that cent percent of the firms have made some attempts to standardise the drug preparation.

6.18. Quality Control of Drugs

Table 73

Type Quality Control of Drugs

Type of quality control	Firms	Percentage
Traditional	11	22.00
Modern	12	24.00
Traditional & Modern	25	50.00
Computer assisted	2	4.00
Total	50	100.00

Table 73 shows that 22 percent of the firms use traditional way for quality control and 24 percent of the firms use modern ways for quality control. At the same time 50 percent of the firms use both traditional and modern techniques for quality control. Only four percent of the firms use computer assisted quality control in drug preparation.

6.19. Emphasis on Traditional way of Production

Table 74

Weakness due to Emphasis on Traditional way of Production

Emphasis on traditional way	Firms	Percentage
No	16	32.00
Yes	34	68.00
Total	50	100.00

Table 74 shows that 68 percent of the firms are of the view that Ayurvedic products have weakness due to over emphasis on the traditional ways. At the same time 32 percent of the firms responded that there is no such problem in resorting the traditional way of drug preparation. This reveals that the majority of the manufacturers of Ayurvedic products are of the view that Ayurveda faces some weakness due to its over emphasis to traditional ways.

6.20. Ayurveda as a Global Medicine

Table 75

Ayurveda as a Global Medicine

Global Medicine	Firms	Percentage
Yes	50	100.00
No	0	0.00
Total	50	100.00

Table 75 shows that Cent percent of the manufacturers are of the opinion that Ayurveda will become a global science of living.

6.21. Knowledge in Information Technology

In the recent years the traditional systems of medicine are tremendously developing on par with the modern medicine particularly in the field of research, application of drugs, surgery and drug production. There has been serious attempt by WHO to give good boost to the concept of integration of both traditional and modern medicine through the application of modern scientific knowledge and information technology in order to provide maximum health care system, with a minimum cost to the needy people.

6.21.1. Awareness of Information Technology

Table 76

Awareness of Information Technology

Awareness on IT	Firms	Percentage
Yes	39	78.00
No	11	22.00
Total	50	100.00

Table 76 shows the awareness of information technology of manufacturers. The analysis shows that 78 percent of the manufacturers have the idea about information technology and 22 percent of the manufacturers have no idea about information technology.

Table 77

Awareness of IT According to the Size of the Firms

Large & Medium firms		Small firms		Z-value
No.	%	No.	%	
26	90.00	13	60.00	2.509*

*Significant at 5% level. ** Significant at 1% level

Table 77 shows that 90 percent of the large and medium scale firms have idea about information technology. At the same time 60 percent of the small firms have some idea about information technology. The Z value (2.509) shows that the difference between the percentages of large/medium firms and small type firms having idea about information technology is so large and significant at five percent level. The result thus shows that large and medium firms have more idea on information technology than small scale firms.

6.21.2. Information Technology in Drug Preparation

Table 78

IT on drug preparation

Use of IT on Drug Preparation	Firms	Percentage
Yes	0	0.00
No	50	100.00
Total	50	100.00

Table 78 shows that there is no Ayurvedic firm in Kerala which resort to information technology for drug production.

6.21.3. Future Plan for using Information Technology in Drug Production

Table 79

Future Plan for Using IT

Future Plan for using IT	Firms	Percentage
Yes	22	44.00
No	28	56.00
Total	50	100.00

Table 79 shows that 44 percent of the firms have future plan for using IT in practice. At the same time the majority (56 percent) of the firms have no plan for using IT in future for drug production.

6.22. Attitude of Manufacturers towards IT

6.22.1. Availability of Internet Connection

Table 80

Availability of Internet Connection

Internet connection Available	Firms	Percentage
Yes	32	64.00
No	18	36.00
Total	50	100.00

Table 80 shows that 64 percent of the Ayurvedic firms have internet connection and 36 percent firms do not have internet connection. This shows that the majority of the firms have Internet connection.

Table 81

Availability of Internet Connection According to the Size of the Firms

Large & Medium firms		Small Firms		Z-value
No.	%	No.	%	
22	73.00	10	50.00	3.534**

*Significant at 5% level. ** Significant at 1% level

Table 81 shows that 73 percent of the large and medium firms and 50 per cent of the small firms have internet connection at their firms. The Z value (3.534) shows that the difference between the proportions of the two groups of firms in the availability of internet connection is so large and significant. This shows that large and medium firms are ahead of small firms in the internet connectivity.

6.22.2. Hosting Websites on the Internet

Table 82

Website on the Internet

Website Available	Firms	Percentage
Yes	24	48.00
No	26	52.00
Total	50	100.00

Table 82 shows 48 percent of the firms have websites on the internet and 52 percent firms do not have websites on the internet. This shows that the majority of the firms have no websites of their own.

Table 83

Distribution of Websites among Firms

Large & Medium firms		Small Firms		Z-value
No.	%	No.	%	
18	36.00	6	12.00	4.127**

*Significant at 5% level. ** Significant at 1% level

Table 83 shows that 36 percent of the large and medium firms and 12 percent of the small firms have websites on the internet. The Z value (4.127) shows that the difference between the two groups of firms hosting websites on the internet is large and statistically significant. It can be seen that large and medium firms are ahead of the small firms in this regard also.

6.22.3. Information Technology and the Efficiency of Drug Production

Table 84

IT and Efficiency

IT and Efficiency	Firms	Percentage
Yes	28	56.00
No	22	44.00
Total	50	100.00

Table 84 shows that 56 percent of the firms are of the opinion that information technology will improve the efficiency of manufacturing Ayurvedic products. At the same time 44 percent of the firms opined that information technology will not improve the efficiency of manufacturing Ayurvedic products. Hence, it can be observed that the majority of the manufacturers are of the opinion that IT will increase efficiency of manufacturing Ayurvedic products.

Table 85

Opinion about IT and Efficiency According to the Size of the Firms

Large & Medium firms		Small Firms		Z-value
No.	%	No.	%	
25	85.00	3	15.00	3.721**

*Significant at 5% level. ** Significant at 1% level

Table 85 shows that 85 percent of the large and medium firms and 15 percent of the small firms have the opinion that the use of IT will increase the efficiency of manufacturing Ayurvedic products. The Z value (3.721) shows that the difference between the proportions of the percentages of the two

groups of firms are large and statistically significant. It can be seen that large and medium firms are more in favour of IT in this regard.

6.22.4. E-Commerce in Ayurvedic Products

Table 86

E-commerce in Ayurvedic Products

E-commerce	Firms	Percentage
Yes	23	46.00
No	27	54.00
Total	50	100.00

Table 86 shows that 46 percent of the firms are of the view that there is scope for e-commerce for Ayurvedic products. At the same time the majority of the firms (54 percent) are of the view that there is no scope for e-commerce.

Table 87

E-Commerce according to the Size of Firms

Large & Medium Firms		Small Firms		Z-value
No.	%	No.	%	
18	60.00	5	25.00	2.433*

*Significant at 5% level. ** Significant at 1% level

Table 87 shows that 60 percent of the large and medium type firms and 25 percent of the firms of small scale believe that there is scope for e-commerce. The Z value (2.433) shows that the difference between the proportions of the two groups of firms is large and significant. Hence it can be observed that large and medium firms are more in favour of e-commerce.

6.23. Research and Development in Ayurvedic Drug Production

Table 88

Research and Development in Ayurvedic Drug Production

R & D	Firms	Percentage
Low	40	80.00
Very Low	10	20.00
High	0	0.00
Total	50	100.00

Table 88 shows that 80 percent of the firms opined that research and development in the manufacturing of Ayurvedic medicine is low comparing to modern allopathic medicine. But at the same time 20 percent of the firms responded that Research and Development is very low in Ayurvedic drug production. Nobody has opined that Research and Development is high. The overall analysis shows that the research and development in Ayurvedic drug production is comparatively low.

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SUMMARY, CONCLUSION, IMPLICATION AND SUGGESTIONS

Hemachandran Nair. G "Study of the application of information technology in the treatment and preparation of medicine in ayurveda with special reference to Kerala" Thesis. Department of Library & Information Science, University of Calicut, 2005

CHAPTER VI

SUMMARY, CONCLUSION, IMPLICATION AND SUGGESTIONS

Methodology in Retrospect
Major Findings
Conclusion
Tenability of Hypotheses
Implications and Suggestions
Suggestions for Further Research

SUMMARY, CONCLUSION,
IMPLICATION AND SUGGESTIONS

This chapter presents the methodology in retrospect, major findings, conclusion, tenability of hypotheses, implications and suggestions for further research.

1. METHODOLOGY IN RETROSPECT

1.1. The Problem of the study

The study is entitled as "**Study of the Application of Information Technology in the Treatment and Preparation of Medicine in Ayurveda with special reference to Kerala**"

1.2. Variables

The variables of the study are

1.2.1. Variables of Ayurvedic Practitioners

The major variables under study is the application of IT in the diagnosis and treatment by Ayurvedic practitioners.

Following are the classificatory variables.

a) Age

b) Gender

c) Qualification

d) Experience and

e) Specialisation of the practitioners

1.2.2. Variables of the Manufacturers

The major variables under study is the application of IT in the preparation of Ayurvedic drugs.

The size of the manufacturing firms is taken as the classificatory variables

1.3. Objectives

1. To examine the relevance of Ayurveda as an alternate system of medicine.
2. To asses the present level of application of IT in the treatment of diseases by Ayurveda system.
3. To identify whether there exists any significant difference among different groups of Ayurvedic practitioners in the use of IT in their practice.
4. To explore the extent of modernisation in the preparation of Ayurvedic medicine by the application of IT.
5. To understand whether there exists any significant difference between large/medium and small firms in the application of IT in the manufacture of Ayurvedic medicine.
6. To explore the level of research and development in Ayurveda.
7. To explore the possibilities of IT application in the treatment and manufacture of Ayurvedic medicine.

1.4. Hypotheses

1. Ayurveda is a highly relevant alternate system of medicine in the modern times.
2. The level of use of IT in the Ayurvedic treatment is poor.

3. There exists significant difference among different groups of Ayurvedic practitioners in the use of IT in their practice.
4. The modernisation in the preparation of medicine by the use of IT in Ayurveda is not extensive.
5. There exists significant difference between large/medium and small firms in the application of IT in the manufacture of Ayurvedic medicine.
6. The level of research and development in Ayurveda is low.
7. There is wide scope for application of IT in the treatment and manufacture of Ayurvedic medicine.

1.5. Sample

The sample consists of 110 Ayurvedic practitioners and 50 Ayurvedic drug manufacturers in Kerala.

1.6. Tools

The required data were collected using the following tools constructed by the investigator.

1. Questionnaire for Ayurvedic practitioners and
2. Questionnaire for Manufacturers of Ayurvedic Medicine.

1.7. Statistical Techniques Used

The following statistical techniques were used to analyse the data to arrive at conclusions and to test the hypotheses:

1. Percentage analysis.
2. The z-test for significance

2. MAJOR FINDINGS

2.1. The analysis shows that the majority of the practitioners (54.55 present) have 10 to 20 patients daily on an average (Table 6). Table 7 reveals that

the majority of the practitioners (74.55 percent) are using mixed way of diagnosis and treatment which combines both modern and traditional ways. It can be seen from Table 11 that the majority of the practitioners are using modern diagnostic methods like ECG (90 percent), X-ray (99.09 percent), Clinical labs (98.18 percent).

Table 49 reveals that the majority of the firms (88 percent) have BAM/BAMS degree holders as technical staff for drug production. It can be seen from the Table 51 that the majority of the firms (58 percent) have BAM/BAMS degree holders as technical staff for quality control. All these reveal that Ayurveda is an alternate system of medicine.

2.2. Only 19.09 percent of the Ayurvedic practitioners are using IT in their practice (Table 31) and 21. 82 percent have their own website on the Internet (Table 37). These reveal that the application of IT is low in the treatment of disease by the Ayurvedic practitioners.

2.3. It can be observed from Table 32 that there is no significant difference between the practitioners in the two age groups (below 45 years and above 45 years) (Z=1.038), between the male and the female practitioners (Z=1.085) and between those who have below 20 years of experience and above 20 years of experience (Z=1.420) in the use of IT in their practice. However significant difference exists between the practitioners with degree/diploma and with post graduate degree in Ayurveda (Z =1.983) and between specialised practitioners and general practitioners (Z=1.964) in this case. It can be seen that those who have more qualifications and specialisation are using IT more in their practice.

2.4. It can be seen from the Table 60 that only 10 percent of the Ayurvedic firms are using modern methods of drug production. No Ayurvedic firm is using IT in drug production (Table 78). It can be observed from these

figures that the extent of modernisation in the preparation of Ayurvedic medicine by the application of IT is limited.

2.5. It can be seen from Table 61 that there is no significant difference between large/medium firms and small firms in the use of modern methods of drug production (Z=1.952). As there is no firm using IT in drug production it is apparent that there is no difference between large/medium firms and small firms in the application of IT in the manufacture of Ayurvedic medicine.

2.6. The majority of the Ayurvedic practitioners (96.36 percent) are of the opinion that research and development in Ayurvedic medicine is low (Table 44). Also 80 percent of the Ayurvedic drug manufacturers are of the opinion that research and development in the manufacture of Ayurvedic medicine is low (Table 88). These reveal that the level of research and development in Ayurveda is low.

2.7. The majority of (99.09 percent) of the practitioners believe that Ayurvedic system will become a global science of living (Table 28). Among the Ayurvedic practitioners, the majority (85.45 percent) have knowledge about IT (Table 29). Table 33 shows that 70 percent of the practitioners have future plan for using IT in their practice. The majority of the practitioners (80 percent) are of the view that there is scope for online treatment in Ayurveda (Table 38). A great majority of (71.82 percent) of the practitioners are in favour of computer aided diagnosis and treatment (Table 40). Table 75 shows that cent percent of the manufacturers are of the view that Ayurveda will become a global science of living. It can be seen from Table 76 that 78 percent of the Ayurvedic drug manufacturers have knowledge in IT. The majority (56 percent) of the manufacturers believe that IT will improve the efficiency of manufacturing Ayurveda products (Table 84). All these reveal that there

is great possibilities of IT application in the treatment and manufacture of Ayurvedic medicine.

3. CONCLUSION

The result of the analysis of the data collected from Ayurvedic practitioners and manufacturers of Ayurvedic medicine reveals that a considerable number of people are resorting to Ayurveda for treatment of their diseases. Mixed way of diagnosis and treatment which combines traditional as well as modern methods is the most popular among the practitioners. Modern way of diagnosis and treatment is also used by a good number of practitioners. Modern technologies are also popular among them. The majority of the Ayurvedic manufacturing firms have BAM/BAMS degree holders as their technical staff for manufacturing Ayurvedic products and for quality control. Thus it can be observed from these that Ayurveda is an alternate system of medicine.

The use of IT is not so common among the Ayurvedic practitioners.

No much difference can be observed between the practitioners in two age groups, between the male and female practitioners, and between those who have less than 20 years of experience and above 20 years of experience, in the use of IT in their practice. However considerable difference is observed in the use of IT among the practitioners according to qualification and specialisation. More qualified and specialised practitioners are using IT more in their practice.

Only a very few firms are using modern technologies in the production of Ayurvedic drugs. Computers are used only by a few firms for keeping the accounts. For the production of Ayurvedic medicine, no firms is using IT. Hence it can be seen that IT application is not extensive in the preparation of Ayurvedic medicines. No much difference can be observed in the use of modern technology and IT by large/medium and small firms in the production of Ayurvedic medicine.

Low level of research and development activities are observed in Ayurveda by the practitioners and manufacturers.

Over emphasis on traditional way of practice is one of the major weaknesses of the Ayurvedic systems. The majority of the practitioners and all the manufacturers are of the view that Ayurvedic system will become a global science of living. The majority of the Ayurvedic practitioners as well as manufacturers have knowledge in IT and the majority of the practitioners have future plan for using IT. The majority of the practitioners are of the view that there is scope for online treatment in Ayurveda and a great majority of the practitioners are in favour of computer aided diagnosis. All these reveal that there is great scope for application of IT in the practice and manufacture of Ayurvedic medicine.

4. TENABILITY OF HYPOTHESES

Based on the statistical analysis of data the hypotheses are tested.

The first hypothesis states that Ayurveda is a highly relevant alternate system of medicine in the modern times. The analysis reveals that a good number of people are resorting to Ayurveda for treatment. The use of mixed way of diagnosis and treatment and the use of modern technologies for diagnosis are higher among the practitioners. There is high level of qualified staff in the manufacture and quality control of medicine. All these show that Ayurveda is almost as popular and developed system as Allopathy though not at the same level. Hence it can be observed that Ayurveda is an alternate system of medicine. Thus the hypothesis is fully substantiated.

The second hypothesis states that the level of use of IT in the Ayurvedic treatment is poor. The percentage of practitioners who use IT in their practice is less. Hence it can be observed that the level of use of IT in Ayurvedic practice is low. Thus the hypothesis is fully substantiated.

The third hypothesis states that there exists significant difference among different groups of Ayurvedic practitioners in the use of IT in their practice. The Z values reveal that no significant difference exists between the practitioners in the two age groups (below 45 years and above 45 years), between the male and the female practitioners and between those who have below 20 years of experience and above 20 years of experience . However significant difference exists between the practitioners with post graduate degree in Ayurveda and those without postgraduation and between specialised and general practitioners. Thus the hypothesis is partially substantiated

The fourth hypothesis states that the modernisation in the preparation of medicine by the use of IT in Ayurveda is not extensive. The result of the analysis shows that only a very few firms are using computers in keeping accounts. Also no firm is using IT for drug production. Thus it can be understood that the application of IT in the production of Ayurvedic medicine is very low. Hence, the hypothesis is fully substantiated.

The fifth hypothesis states that there exists significant difference between large/medium and small firms in the application of IT in the manufacture of Ayurvedic medicine. The Z value shows that there is no significant difference between large/medium and small firms in the use of modern technology. As it is not used by any firm, there is no difference in the use of IT by large/medium and small firms. Thus the hypothesis is not substantiated.

The sixth hypothesis states that the level of research and development in Ayurveda is low. The analysis reveals that the majority of the Ayurvedic practitioners and firms are of the opinion that the research and development in Ayurvedic medicine is low. It can be observed that the level of research and development in Ayurveda is low. Thus the hypothesis is fully substantiated.

The seventh hypothesis states that there is wide scope for application of IT in the treatment and manufacture of Ayurvedic medicine. The analysis reveals that the majority of the Ayurvedic practitioners and all the manufacturers are of the opinion that Ayurveda will become a global science of living. It can be seen that the majority of the Ayurvedic practitioners as well as manufactures have knowledge in IT. The majority of the practitioners have future plan for using IT in their practice and the majority are in favour of computer aided diagnosis. All these reveal that there is wide possibilities of using IT in the treatment and manufacture of Ayurvedic medicine. Thus the hypothesis is fully substantiated.

5. IMPLICATIONS AND SUGGESTIONS

The study brings to light the relevance of Ayurveda as a global system of medicine which is developing as an alternative system of medicine. This suggests that the indigenous system of medicine of India which is eco-friendly and holistic needs modernisation and support.

The application of IT in the practice as well as in the manufacture of Ayurvedic medicine is low. This may be because of the traditional outlook of the practitioners about Ayurveda.

No much difference can be observed between the practitioners in the two age groups, between the two gender groups and between the groups having less than 20 years of experience and more than 20 years of experience, in the use of IT in their practice. However those who have more qualification and specialisation are using IT more in their practice. This may be because of their high knowledge and IT and its application. Ayurvedic firms of large/medium and small firms show no difference in the use of IT in manufacturing Ayurvedic medicine. The reason may be the low level of use of IT in both these types of firms.

The research and development activities in Ayurveda is comparatively low. The reason may be that, this is an Indian system of medicine and the attention given to the development of this system is not up to the level. As a holistic system which has no side effect, the system has to be given governmental support. As the Ayurvedic medicines have great scope for export it is inevitable that the government should support the development of Ayurveda.

Due to the over emphasis on traditional way of practice, Ayurvedic system is still in its infancy. There is every possibility for becoming this system a global science of living. It can also be seen that there is every possibility for IT application in the practice and manufacture of Ayurvedic medicine. What is needed is a change in the over emphasis on traditional way. The traditional outlook of practitioners has also to be changed. The governmental support for modernisation of Ayurveda system through research and development will create an atmosphere of modernisation of Ayurveda practice and preparation of medicine with the application of IT.

6. SUGGESTIONS FOR FURTHER RESEARCH

The study of application of information technology in Ayurveda is a complex process and multidisciplinary with the theories of computer science, information and communication technology and information science and medicine. Because of these complexities, no previous attempt has been made to conduct research in the similar area. Hence this is a pioneering attempt to study the application of information technology in Ayurveda with regard to the treatment and preparation of medicine by the investigator and deals with the topic in a general and basic manner and tries to open a gateway for research in depth. The study is limited to Kerala. The suggestions for further research as identified by the investigator are the following:

1. A comprehensive study of the application of information technology in Ayurveda may be conducted by taking sample from the whole country.

2. In order to assess the international and national awareness of Ayurveda treatment and products, and to understand the status in the application of IT, studies may be conducted at an international level.

3. Similar studies on the other systems of medicines like Homoeopathy, Unani, and Siddha may be conducted to assess the existing level of application of information technology among them.

4. A detailed study may be conducted to understand whether the application of IT has improved the efficiency of Ayurvedic practice and manufacture of medicine.

5. A comparative study of the application of IT in Ayurveda and Allopathy may be conducted.

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APPENDICES

APPENDIX I

DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE
UNIVERSITY OF CALICUT
KERALA, 673 635

Questionnaire for Ayurvedic Practitioners

Dr. Raju M. Mathew
Reader & Head
Department of Library and Information Science
University of Calicut.

Hemachandran Nair, G.
Research Scholar

Dear Sir/Madam,

We are conducting a research study on the topic "Study of the application of information technology in the treatment and preparation of medicine in Ayurveda with special reference to Kerala".

The enclosed questionnaire is intended to study the application of Information Technology in the practice of Ayurvedic medicine. The questions are so designed that you may just tick mark in the appropriate box(es) or simply write in one or a few words. Kindly cooperate with us in completing the study.

Yours sincerely,

Dr. Raju M. Mathew

Hemachandran Nair, G.

Please record your answer to the following questions

I. Personal Data

a) Name of Practitioner..

b) Age :

c) Sex : ☐ Male ☐ Female

d) Qualification: ....

Traditional ☐ Degree ☐

Diploma ☐ Post graduate ☐

Research degree ☐

e) Experience .... Years

f) Area of specialization ....

II Professional Variables

1. On an average, how many patients do you consult in a day? ☐

2. Which type of diagnostic methods you are following?

☐ Mixed ☐ Modern ☐ Traditional

3. Do you keep the records of disease and course of treatment of your patients?

Yes ☐ No ☐

4. If Yes, how do you keep those records?

☐ As case sheets ☐ Registers ☐ Computers

Others (specify) : ....

5. Which are the modern Diagnostic Equipments used in your practice?

☐ ECG ☐ MRI ☐ X-ray

☐ Clinical Lab ☐ C T Scan ☐ Ultrasound Scan

☐ Angeography ☐ Others (specify)

6. Do you have any special interest in the medicines of a particular Ayurvedic manufacturing firm? ☐ Yes ☐ No

7. Does the different Ayurvedic firms have the same quality in same medicine? ☐ Yes ☐ No

8. Is there any attempt made to standardise the preparation of medicine?

☐ Yes ☐ No

9. Do you update yourself with the new knowledge in the science of Ayurveda

☐ Yes ☐ No

10. If Yes, what is your sources of information

☐ Books ☐ Journals ☐ Internet ☐ Seminars ☐ Discussions

Others (specify) : ....

11. Are you satisfied with people's awareness about the scope of Ayurveda

☐ Yes ☐ No

12. Does the Ayurvedic system has certain basic weakness due to its over emphasis on traditional way of practice? ☐ Yes ☐ No

13. Are you confident that one day Ayurvedic system will become a global science of living ☐ Yes ☐ No

III Knowledge of Ayurveda Practitioners about IT

14. Do you have any idea about Information Technology (IT)? ☐ Yes ☐ No

15. If yes, are you using Information Technology in practice? ☐ Yes ☐ No

16. Do you have any future plan for using IT in your practice? ☐ Yes ☐ No

IV Attitude of Ayurvedic practitioners towards IT

17. Can you mention the effectiveness of computerised documentation and retrieval of information related to Research and Development in Ayurveda

    Very effective ☐ Effective ☐ Normal ☐ Poor ☐

18. Do you have Internet connection at your home/ place of practice?

    Yes ☐ No ☐

19. Do you have your personal website on the Internet?

    Yes ☐ No ☐

20. Is there any scope for online treatment in Ayurveda?

    Yes ☐ No ☐

21. Are you in favour of computer aided diagnosis and treatment ?

    Yes ☐ No ☐

22. Do you think that IT will increase the efficiency of Ayurveda Practitioners?

    Yes ☐ No ☐

V Research and Development in Ayurveda

23. What is your opinion about the Research and Development in Ayurveda as compared to Allopathy?

    Equal ☐ Low ☐ Very Low ☐

Thank you

APPENDIX II

DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE
UNIVERSITY OF CALICUT
KERALA, 673 635

Questionnaire for Manufacturers of Ayurvedic Medicine

Dr. Raju M. Mathew
Reader & Head
Department of Library and Information Science
University of Calicut.

Hemachandran Nair, G.
Research Scholar

Dear Sir/Madam,

We are conducting a research study on the topic "Study of the application of information technology in the treatment and preparation of medicine in Ayurveda with special reference to Kerala".

The enclosed questionnaire is intended to study the application of Information Technology in the manufacture of Ayurvedic medicine. The questions are so designed that you may just tick mark in the appropriate box(es) or simply write in one or a few words. Kindly cooperate with us in completing the study.

Yours sincerely,

Dr. Raju M. Mathew

Hemachandran Nair, G.

Please record your answer to the following questions

I Personal Characteristics

a) Name of The Firm ....

b) Year of Est...........

c) Size of firm ☐ Large ☐ Medium ☐ Small

d) Name of the Licensee ....

e) Qualification of the licensee:

Degree ☐ Diploma ☐ Research degree ☐

Post graduate ☐

f. Area of specialization : ....

II Professional Variables

1. Is the licensee working as technical staff for manufacturing of drugs?

Yes ☐ No ☐

2. Do you have technical staff in the following areas?

Area		**Qualification**
Manufacturing	Yes / No	
Quality Control	Yes / No	
Marketing	Yes / No	

3. Do you manufacture any patented drug Yes☐ No☐

4. What type of drugs you are preparing?

☐ Herbal Drugs ☐ Metallic/Mineral

☐ Herbo-Mineral

5. Which type of method do you follow for manufacture of Ayurvedic products? Mixed ☐ Modern ☐ Traditional ☐

6. Do you keep accounts related to processing and distribution of Ayurvedic products ? Yes ☐ No ☐

   If Yes, how do you keep accounts?

   As bills/vouchers ☐ In Registers ☐ In Computers ☐

   Others (specify)..

7. Are you following any Ayurvedic Pharmacopoeia for the preparation of drugs?

   Ayurvedic Pharmacopoeia ☐ Traditional Formula ☐

8. Do you posses GMP Certificate? Yes ☐ No ☐

9. Do you use modern equipment for manufacturing of drugs

   Yes ☐ No ☐

10. Do you update yourself with the developments in the preparation of drugs technology? ☐ Yes ☐ No

    If Yes, what are your sources of information for updating the developments

    ☐ Books ☐ Journals ☐ Internet
    ☐ Seminars

    Others (specify) ....

11. Are you growing medicinal plants for drug preparation? ☐ Yes ☐ No

12. Are you satisfied with people's awareness about Ayurvedic products?

    ☐ No ☐ Yes

13. Do you believe that different manufacturing firms have same quality in same medicine ? ☐ Yes ☐ No

14. Have you made any attempt to standardise the preparation of medicine?
    ☐ Yes ☐ No

15. What type of quality control you adopt in the drug preparation?

    ☐ Traditional ☐ Modern technique ☐ Computer Assisted

16. Does the manufacture of Ayurvedic products has certain basic weakness due to its over emphasis on traditional way of preparation? ☐ Yes ☐ No

17. Are you confident that one day Ayurveda will become a global science of living? ☐ Yes ☐ No

III Knowledge of manufacturers about IT

18. Do you have any idea about Information Technology ? ☐ Yes ☐ No

19. If Yes, are you using Information Technology in drug preparation?

    No Yes

20. Do you have any future plan for using IT in drug preparation? ☐ Yes ☐ No

IV Attitude of Manufacturers towards IT

21. Do you have internet connection at your manufacturing firm?

    Yes No

22. Do you have website of your firm on the internet ?

    Yes ☐ No ☐

23. Is there any scope for E-commerce in Ayurvedic products?

    Yes ☐ No ☐

24. Do you think that modern IT will increase the efficiency of manufacturing Ayurvedic products? ☐ No ☐ Yes

V Research and Development in Manufacture of Drugs

25. What is your opinion about the Research and Development in manufacturing technology in Ayurveda as compared to Allopathy?

    High ☐ Very Low ☐ Low ☐

Thank you

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