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Role of *Swasthavritta* in Ayurveda for healthy life : A Review

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ABSTRACT

The objective of preventive medicine is to oppose the disease in order to preserve the health, promote the health, prolong the life and to minimize sufferings. Food is said to be cause of stability for all the living beings. There is nothing except diet for sustaining the life of living beings. The *Srotas* which carries "Anna" (food) are called as *Annavaha Srotas*. *Annavaha Srotas* can be correlated with gastrointestinal tract. According to Ayurveda consumption of *Apathyā* and *Ahitkara Ahara* is the main cause of *Annavaha Srotas Dushti*. Commonly *Mahastrotas* is the term applicable to *Annavaha Strotas*. The *Ahara/Aushadhi* which is not causing any harm to *Srotas* and is wholesome to the body and mind is *Pathya*. Ayurveda specially expresses the importance of food in maintaining & promoting good health as well as in curing diseases. We observe mainly individual suffering from deficiency disease, even after consumption of the so-called balanced diet. Ideal diet means just not only the consumption of carbohydrate, protein, fat etc. The diet should have the qualities like *Hita Ahara*, *Satmya-Ahara*, *Aviruddha Ahara*, *Sarva-Rasa-Sannivishta-Ahara*. To obtain maximum benefit from the diet we take, it is necessary to follow certain dietetics rules like *Asta Ahara Vidhi Visheshayatanani*, *Ahara Vidhi Vidhan*, *Dwadashashana Pravichara* etc. By adopting these rules regulations related to *Ahara Sevana* one can prevent the *Annavahastrotao Dushti*, which in turn helps to avoid diseases

Key words: Lifestyle Diseases, Sulphites, Gastrointestinal, Prevention, Swasthavritta, Ayurveda

INTRODUCTION

Lifestyle diseases are those diseases whose occurrence is based on the daily habits of people are a result of an inappropriate relationship of people with their environment. The main factors contributing to lifestyle diseases include bad food habits, physical inactivity and disturbed biological clock. So, a healthy lifestyle must be adopted with a proper balanced diet, physical activity. Food, cloth & shelter (*Anna*, *Vastra*, *Niwasa*) its 3 main pillars of life. Out of which healthy food plays

major role in life. But in today's life, due to occupational stress, everyone wants many things in less time. So, demand of junk food, addiction of smoking, alcoholism increases. In many foods three classes of chemical preservatives commonly used in foods Benzoates (sodium benzoate), Nitrites (sodium nitrite), sulphites (sulphur dioxide). Due to such eating a poor quality diet high in junk food is linked to a higher risk of obesity, depression, digestive issues, heart disease and stroke, type 2 diabetes, cancer, and early death.

MATERIALS AND METHODS

Lifestyle disorders and its causes

SN	Lifestyle disorders	Causes
1.	Heart diseases like Arteriosclerosis etc.	High BP, diabetes, Smoking, Obesity, Physical activity
2.	Chronic liver disease	Alcohol
3.	Stroke	Smoking, High BP, elevated cholesterol

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4.	Nephritis	Smoking, Diabetes, Hypertension ^[6]
5.	Diabetes	Diet, Obesity, sedentary lifestyle.
6.	Chronic obstructive pulmonary disease	Air pollution, Occupational dust, Long term cigarette smoking.
7.	Cancer	Alcohol, smoking, medication, dietary factors
8.	Hypertension	Obesity, Alcohol, Lack of physical excercises. ^[1]

Preventive treatment through Ayurveda

Nidan Parivarjan

In Ayurveda the best physician is one who cures the patient from diseases and the best medicine is that which makes good health.^[2]

If the knowledge of *Nidan* (diagnosis) is good then the treatment of diseases will be more effective.

The term *Nidan* stands for both *Vyadhijanak* (cause of disease) and *Vyadhibodhak* (knowledge of disease). *Vyadhijanak Nidan* is called as *Hetu* and *Vyadhibodhak Nidan* comprises of *Nidan*, *Purvaroop*, *Roop*, *Samprapti* and *Upashay*.^[3]

Ayurveda has described various types of *Chikitsa*. *Nidan Parivarjan* is *Ekuvidha Chikitsa*.^[4] It is useful to guide about *Pathyapathy* to the patients as *Hetu* becomes *Apopathy* in *Vyadhi*.

Nidan

It is the factor or the cause of disease that is responsible for the disequilibrium between the *Dosha*, *Dhatu* & *Mala* that eventually leading to *Samprapti* (pathogenesis)of the disease.^[5]

Parivarjan

The cause of disease that is responsible for the disequilibrium between *Dosha*, *Dhatu* and *Mala* should be left. Example: *Dadhi* i.e., excessive consumption of *Kapha Dosha* causes diabetes mellitus. Hence eating yogurts should be stopped.^[6]

Nidanparivarjan is to avoid the factors that causes the disease by following the diet and lifestyle. It encompasses the idea to refrain from precipitating or aggravating factors of the disease.^[7] Through falling *Dincharya*, *Rutucharya*, *Ratricharya*, *Annapanavidhi* mentioned in classical text.

Rasayana

Rasayana Chikitsa is one of the important branches of Ayurveda that helps to maintain healthy lifestyle. As per Ayurveda, *Rasayana* improve immunity and perform many vital functions of human body. Many herbs and dietary material can act as *Rasayana*. Here we mentioned *Naimattik Rasayan* and *Achar Rasayan*. *Naimaitik Rasayana* is the type of *Rasayana* therapy utilized for curative purpose. It hastens the recovery from prevailing diseases.

Rasayana drug according to Dhatus^[8]

Rasa - Khajura, Kashmari, Draksha

Rakta - Aamlaki, Lauha, Palandu

Mamsa - Bala, Ashwagandha

Meda - Guggulu, Shilajatu, Amrita

Asthi - Shankha, Laksha, Majja

Majja - Vasa, Majja, Lauha

Shukra - Pippali, Nagbala, Aatmagupta

Rasayana drug according to Srotas^[9]

Pranvaha Strotas	Bhallatak, Amalaki, Pippali
Udakvaha Strotas	Sarva Jaliya Padarth
Annavaha Strotas	Hing, Nagkeshar, Panchakol
Rasavaha Strotas	Guduchi, Laja Manda
Raktavaha Strotas	Kushthaghna Dravyas, Ghrit
Mansavaha Strotas	Suwarna, Kumbha
Medovaha Strotas	Shilajatu, Guggulu
Asthivaha Strotas	Abha
Majjavaha Strotas	Bhringaraj, Vacha, Bhasma

<i>Sukravaha Strotas</i>	<i>Koncha, Vang Bhasma</i>
<i>Mutravaha Strotas</i>	<i>Punarnava, Gokshura</i>
<i>Purishvaha Strotas</i>	<i>Bilwa, Haritaki</i>
<i>Swedavaha Strotas</i>	<i>Vang Bhasma</i>

Rasayana drug according to disease

<i>Prameha</i>	<i>Amalaki, Haridra</i>
<i>Hridroga</i>	<i>Arjuna, Shalparni</i>
<i>Amavat</i>	<i>Bhallatak, Amrita</i>
<i>Shwas</i>	<i>Bhallatak</i>
<i>Pandu</i>	<i>Lauha</i>
<i>Mansaroga</i>	<i>Medhya Rasayan</i>
<i>Kushtha</i>	<i>Tuvarak</i>
<i>Medoroga</i>	<i>Hartaki, Guggulu</i>

Achar Rasayana^[10]

- *Achar Rasayana* means good conduct
- A person must be truthful
- Must not indulge in violence
- Person must be free from harbours act
- Should be free from ego.
- Must have excellent sense organ.
- Should have love for spiritual knowledge
- Should have self control.
- Must take milk and ghee regularly.

DISCUSSION

Health and diseases is dependent on three factors i.e., *Ahara* (diet), *Vihara* (life style practices) & *Oushadha* (Drug & therapies). Among these, food (*Ahara*) is considered as most important one. *Pathya* is defined as the *Ahara* (diet) which is congenital to a person according to his constitution, appetite & digestive capacity of the body. Most health problems develop

due to wrong eating and improper cooking. The planning of diet, based on certain principles mentioned in *Astavidhi Vishesayatan* is very rational and scientific. Ayurveda emphasizes the characteristics of food in terms of quality, quantity and time which vary with age, constitution, habitat, digestive power, season, disease and also liking of the patient. *Annavaha Srotas* is the food carrying channel or gastrointestinal tract. Digestive disorders from acid indigestion to celiac diseases, ulcers, vomiting are all indications that the function of *Annavaha Srotas* is being affected by one's diet, lifestyle, environment or other factors.

CONCLUSION

'*Swasthasya Swastha Rakshanam, Aturasya Vikara Prashamanam.*' Is the aim of Ayurveda. Ayurveda is vast medicinal science, which focus on healthy living than treatment of diseases. In present scenario, everyone is in mental and physical stress due to their lifestyle, undisciplined daily regimen, inadequate sleep, lack of exercise, dietetic rules and regulations, metabolic disturbances which are the main causative factor for *Annapachan Vikruti* and the persistence of the same factor denotes the maintenance of the diseases of the system which denotes the permanent damage of the organ. Ayurveda has employed various preventive measures in the form of *Aahar Vihar, Pathya-Apathya Palana, Shatkriyakaal* and its all alarming symptoms *Dincharya, Rutucharya, Yoga* and dietetics to prevent lifestyle disorders. So, in Ayurveda prevention of diseases is more important than curative aspect of disease.

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A Critical Review and Scientific Prospective on Contraceptive Therapeutics from Ayurveda and Allied Ancient Knowledge

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Commonly used synthetic or prescribed hormonal drugs are known to interfere with the endocrine system and may have adverse reproductive, neurological, developmental, and metabolic effects in the body. These may also produce adverse effects such as polycystic ovarian disorder, endometriosis, early puberty, infertility or toxicity to gonads, testicular germ cell cancer, breast or prostate cancer, brain developmental problems, and even birth defects. Globally, the emergence of renewed interest in natural products for reproductive health is on the rise, which offers opportunities for new contraceptive developments. The search for alternate, safer contraceptive products or agents of natural origin is of scientific interest. Ayurvedic classical texts offer knowledge and information about the reproductive function and therapeutics including those for enhancement and limiting male and female fertility. Review of ancient, medieval, and recent—including texts on erotica that provide information on approaches and large numbers of formulations and drugs of plant, mineral or animal origin—claimed to have sterilizing, contraceptive, abortifacient, and related properties is presented. Few among these are known to be toxic and few are not so common. However, most of the formulations, ingredients, or modes of administration have remained unattended to, due to issues related to consumer compliance and limitations of standardization and lack of appropriate validation modalities. Several of these ingredients have been studied for their phytoconstituents and for the variety of pharmacological activities. Efforts to standardize several classical dosage forms and attempts to adapt to modern technologies have been made. List of formulations, ingredients, and their properties linked with known constituents, pharmacological, biological, and toxicity studies have been provided in a series of tables. The possible effectiveness and safety of selected formulations and ingredients have been examined. Suggestions based on new drug delivery systems integrated with advances in biotechnology, to provide prospects for new therapeutics for contraception, have been considered. Ayurveda is built on a holistic paradigm of biological entity rather than limited gonadal functions. Graphic presentation of a few carefully chosen possibilities has been depicted. New approaches to standardization and ethnopharmacological validation of natural contraceptive therapeutics may offer novel mechanisms and modalities and therapeutic opportunities to satisfy unmet needs of contraception.

Keywords: natural contraceptive, herbal contraceptive, ayurved contraceptive, reproductive health and traditional medicine, contraceptive traditions

INTRODUCTION

The world population is expected to reach more than 11 billion by 2050 (Census of India, 2011). Population in the world is currently (2020) growing at a rate of around 1.05% per year. The current average population increase is estimated at 81 million people per year and current world population is 7.9 billion as of March 2021 (World Population Clock, 2021). This burgeoning population particularly in developing countries is a matter of concern for social, economic, and environmental reasons in terms of providing food, shelter, and life. The challenge of dealing with an ever-increasing population has been dealt with largely by conventional medicine using different methods of contraception such as oral contraceptive pills, intrauterine contraceptive devices, and barrier devices. These devices, techniques, and drugs seem to have been efficiently practiced for contraception but with many reported adverse effects as well as failure resulting in unwanted pregnancy. (Dutta, 2013).

BIRTH CONTROL HISTORY

Technically, birth control can be defined as the methods, procedures, or practices that are implemented to prevent conception leading to pregnancy in women. The term can be associated with contraception and family planning where knowledge about birth control is equally important.

The Egyptian Ebers Papyrus from 1550 BCE and the Kahun Papyrus from 1850 BCE have some of the earliest documented descriptions of birth control: the use of honey, acacia leaves, and lint to be placed in the vagina to block sperm. (Lipsey et al., 2005; Cuomo, 2010).

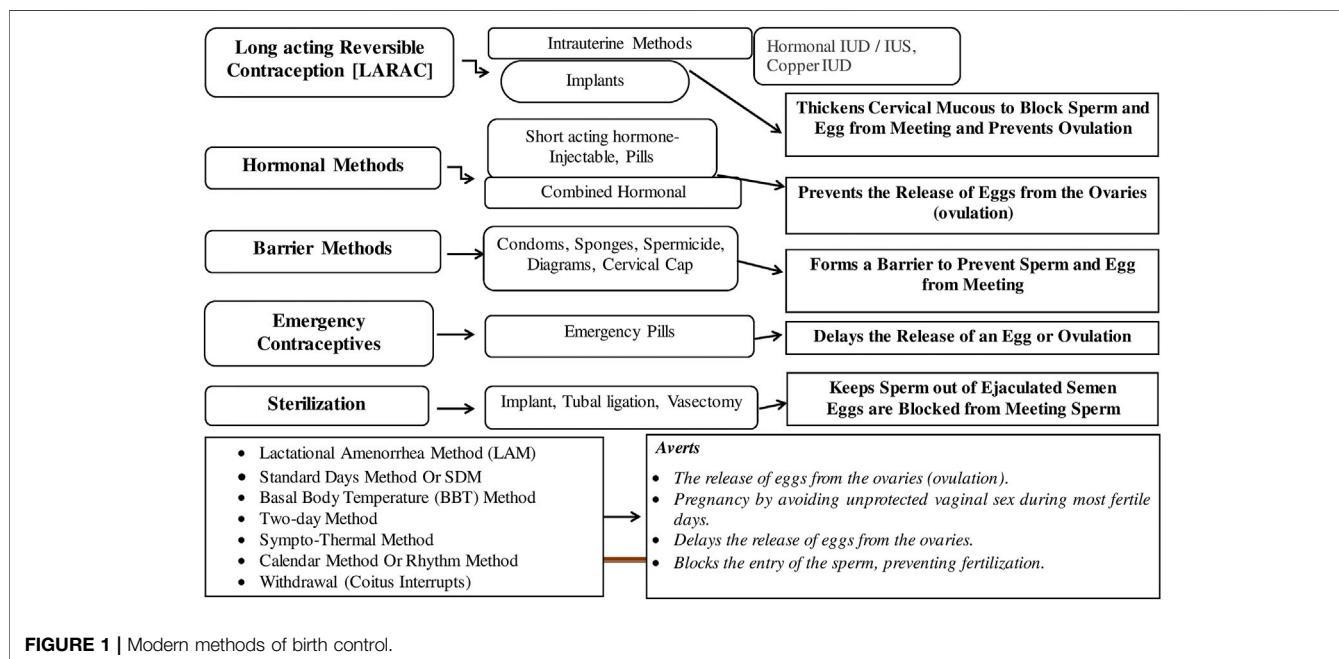
In medieval Europe, any effort to halt pregnancy was deemed immoral by the Catholic Church, (Cuomo, 2010), although it is believed that women of the time still used a number of birth control measures such as coitus interruptus and inserting lily root and rue into the vagina. Women in the middle ages were also persuaded to tie weasel—a small wild animal—testicles around their thighs during sex to prevent pregnancy. The oldest condoms discovered to date were recovered in the ruins of Dudley Castle in England and date back to 1640. They were made of animal gut and were most likely used to prevent the spread of sexually transmitted diseases during the English Civil War (Jon, 2012). Casanova, living in 18th-century Italy, described the use of a lambskin covering to prevent pregnancy; however, condoms only became widely available in the 20th century (Cuomo, 2010).

Modern Methods to Control Fertility (World Health Organization, 2020)

Several methods currently used to curb for contraception are presented (Figure 1).

ADVERSE EFFECTS

Commonly used synthetic or prescribed hormonal drugs are known to interfere with the endocrine system and may have adverse reproductive, neurological, developmental, and metabolic effects in the body. These may cause polycystic ovarian disorder, endometriosis, early puberty, infertility, toxicity to gonads, testicular germ cell cancer, breast or prostate cancer, brain developmental problems, and even birth defects. The search for alternate and safer means/drugs to prevent



birth is an open-ended area of scientific research. It is always an appealing idea to further research to develop contraceptive drugs of natural origin that have high efficacy without any adverse effects on the reproductive system.

UNMET NEEDS

According to a recent report from the Guttmacher Institute, 214 million women of reproductive age in the developing world who want to avoid pregnancy are not using a modern contraceptive method. These women are considered to have an “unmet need” for modern contraception, with 59 million relying on traditional methods such as abstinence and withdrawal and 155 million simply using no contraception at all. (Elizabeth et al., 2020).

India's total fertility rate (TFR) may have declined significantly over the years, but there remain significant challenges in family planning according to new research. In an Economic and Political Weekly article, Purushottam M. Kulkarni of Jawaharlal Nehru University suggested that there is a significant unmet need for contraception in India. Data from National Family Health Surveys (NFHS) have shown that while there was a decline in the unmet need for contraceptive services from 1992-93 (NFHS-1) through to 2005-06 (NFHS-3), and between 2005-06 and 2015-16 (NFHS-4), there has not been any significant improvement in access to contraception. (Mint, 2020).

SIGNIFICANCE OF REVIEW

Despite obvious success, the rise in population continues to remain a medical challenge due to reasons of social, economic, personal, and biological consequences. Though well-established contraceptive drugs and measures have been utilized, the long term and excessive use of hormonal contraceptives are of serious concerns due to their probable adverse effects. There is need to explore the alternative or new possibilities.

The search for an effective and safe contraceptive agent remains a challenge. Contraceptive drugs of natural origin are of all-time research interests. Traditional systems of medicine like Ayurveda address all issues related to health and illnesses based on the principle of equilibrium between the biosphere and cosmo-sphere, which include reproductive phenomenon. Ayurvedic pharmacopoeia has formulations and ingredients that are attributed to affect coitus, spermatogenesis, and ovulation, uterine, fetal, and placental activities. These include emmenagogues, ecbolic drugs, contraceptives, uterine sedatives for females, and depurative or drugs that hamper male sexual and reproductive capabilities, affect fluidity or motility of the seminal fluid, destroy sperms, or impede libido.

A large number of drugs are known to have sterilizing, contraceptive, and abortifacient properties. However, these indigenous means and drugs were extensively used even in rural or tribal cultures until the 20th century, when there has been no noteworthy systematic or scientific efforts to study these aspects except for a few intermittent studies. While the list of such ingredients is quite big, unusually small scientific data are

available about the nature of their active components and about their mechanisms of action.

As biotechnology-based advances open up new vistas in biomedical research, it will be of interest to examine the subject of contraception once again, as in Ayurveda, in the light of present-day pharmacology for future possibilities.

A thoughtful attempt has been made here to explore Ayurvedic and scientific aspects of formulations and ingredients as described in multiplicity of classical texts covering different facets of contraception.

METHODOLOGY

Ancient classical texts, medieval compendia, and other pertinent texts were assessed for enlisting different methods used for contraception and to enlist formulations and ingredients used for a variety of activities that could be pharmacologically linked to contraception. Specific search was undertaken for any existing review that could add to information on the subject. A systematic review of published articles on the subjects related to contraception was undertaken. The description of methods used in the experimental animal models, and the antifertility effect of active ingredients, their doses, safety, and toxicity were examined. Ninety-four plants and six minerals are reported in this review having a variety of contraceptive activities.

Flowchart of the systematic review process to search for contraceptive plants is presented. (Figure 2).

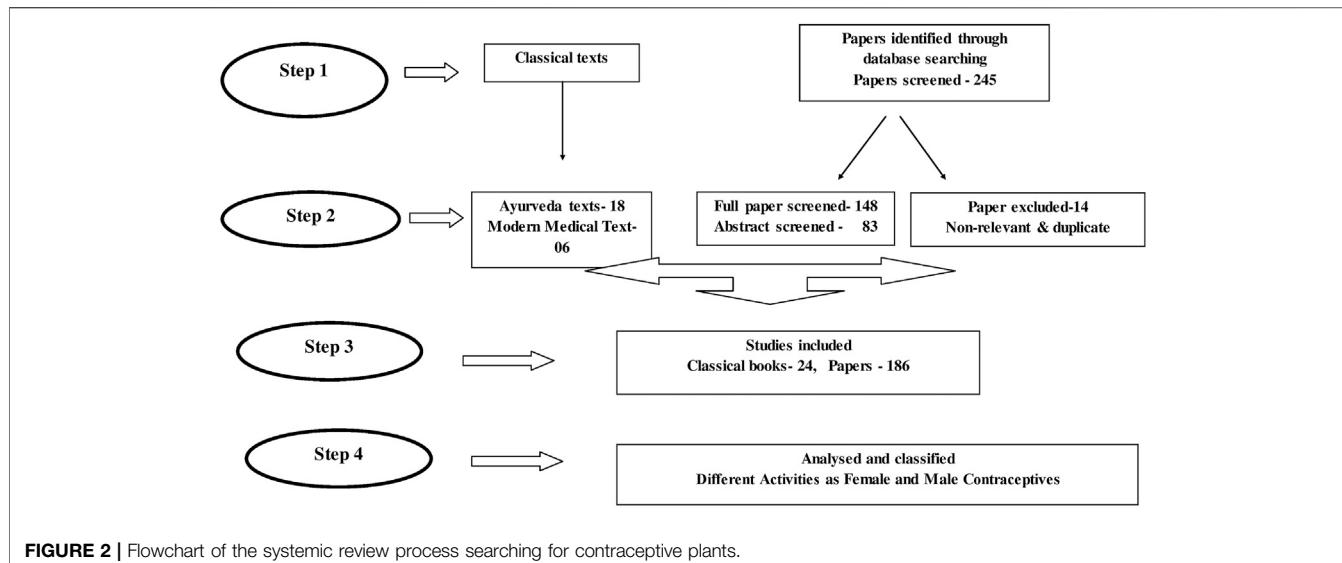
CONTRACEPTIVES IN AYURVEDA AND MEDIEVAL SANSKRIT LITERATURE

Ayurvedic literature is rife with thousands of formulations and has about 1100 ingredients attributed with well-defined therapeutic approaches including reproduction. There are references to temporary or permanent sterilization. Search for contraception from traditional knowledge of Ayurveda has been of interest to the Central Drug Research Institute, Council of Scientific and Industrial Research under Ministry of Science and Technology, and the Central Council for Research in Ayurvedic Sciences under Ministry of Health (now Ministry of AYUSH), bodies under the Government of India. Several other private and industry organizations had undertaken studies in the past. However, there is a need to revive research interest in Ayurveda in reproductive biology for safe, low-cost, user-friendly, and reliable therapeutic solutions to satisfy different contraception requirements.

Vedic Period (1500-500 BCE)

Regulated sexual life or abstinence from sex was considered the ideal method of contraception in Vedic times. The emphasis was more on propensity of the right, healthy progeny. Indirect references to contraception can be found in the *Atharva Veda*.

The use of drugs leading to impotence as punishment meted out to a person committing social sins or to an enemy or infliction



of injury to two cords situated near the scrotum or the scrotum itself, to put an end to one's desire for progeny were in practice. These can be considered as references for use of drugs to prevent conception, vasectomy, and castration, respectively (Satvalekar, 1958a).

A mechanical device made of stone to obstruct multiple channels of *Yoni*—the vaginal cavity to prevent conception has been mentioned. This could be considered as the earliest form of an intrauterine contraceptive device. Similarly, artificially induced changes to make the vaginal cavity rough or dry, besides its mechanical obstruction for futile coitus have been mentioned (Satvalekar, 1958b). This reference reflects some chemical changes to be produced artificially, probably in the cervical mucus obstructing the entry of sperms, or in the endometrium influencing the implantation of the zygote and a mechanical barrier in the vaginal canal. (Tewari and Chaturvedi, 1981). In *Brhadaranyaka Upanishad*, a breath exercise is advised during coitus to avoid conception (Dash and Basu, 1968).

Samhita Period: (300-500 BCE)

Though *Charak Samhita*, *Sushrut Samhita*, and *Ashtang Sangraha-Bruhatryee*, the three ancient most Ayurveda treatises, have elaborated the subject of reproduction extensively, there are no direct references to contraception.

Kshetra—the female reproductive system as the field, *ambu*—the nutrient fluids, *bija*—the sperm or ovum as the seed, *rutukal*—the ideal ovulatory period, *marga*—the female canal, *Vayu*—the neural system, and *hrid*—the psychological status are considered the essential factors for conception. Any or more of these factors if influenced artificially can lead to a failure of conception. The *shukravaha srotas* and *aartavavaha srotas* representing seminal and menstrual flows, respectively, are among the 13th intrinsic and interdependent biological pathways or channels (that could be explained based on now prevalent means of system biology). This early knowledge could pave the way for the development of different kinds of contraceptive

methods prevailing in the present scenario, and all of them influence one or the other factors that have been explained in the ancient classics (Vagbhatt, 2000; Sushrut, 2002).

Contraceptive activities in the context of Ayurvedic principle of fertility are explained in Figure 3.

Medieval Period (1000 AD to 1900 AD)

Rajamartanda written in the 11th century is probably one of the earliest texts to mention a specific prescription for contraceptives. Compendia texts like *Bhava Prakash*, *Yoga Ratnakara*, *Bhaishajya Ratnavali*, *Gadanigrah*, and several others prescribe many herbal and herbo-mineral contraceptive preparations for local and oral use by men and women.

By the 11th century, the oriental connectivity that had sociocultural effects also brought in practices to prevent conception or induce abortion. References to oral and local contraceptives are found in *Bruhad Yoga Tarangini* and *RatiRahasya* [AD800], *RasaPrakashSudhakar* [AD1300], *Panchasayaka*, *Smaradeepika* and *RasaRatnaSamuccchay* [AD1400], *RatiManjiri* [AD1500], *Kandarpchudamani* [AD1577], *AnnangaRang*, *Bhavprakash* and *YogaRatnakar* [AD1600], *YogaRatnaSamucchaya* [AD 1800], and *Brihan Nighantu Ratnakar* and *BhaishajyaRatnavali* [AD 1900].

The subject of contraceptives in ancient times dealt not only with medieval medicine but also with art and the literary works of poets, playwrights, and philosophers. Like *Kama Sutra*, the famous text on erotica, a large number of books in the 19th century contain various recipes for contraception and for inducing abortions and diverse birth control practices.

Some of the most prescribed practices and recipes for preventing conception are as follows.

1. Local Contraceptives for Females

Vaginal fumigation or application before coitus with (1) moistened *Saindhava lavana* (Rock salt) with *Til* (Sesame oil) (Jugnu and Sharma, 2011), (2) wood of *Neem* (*Azadirachta*

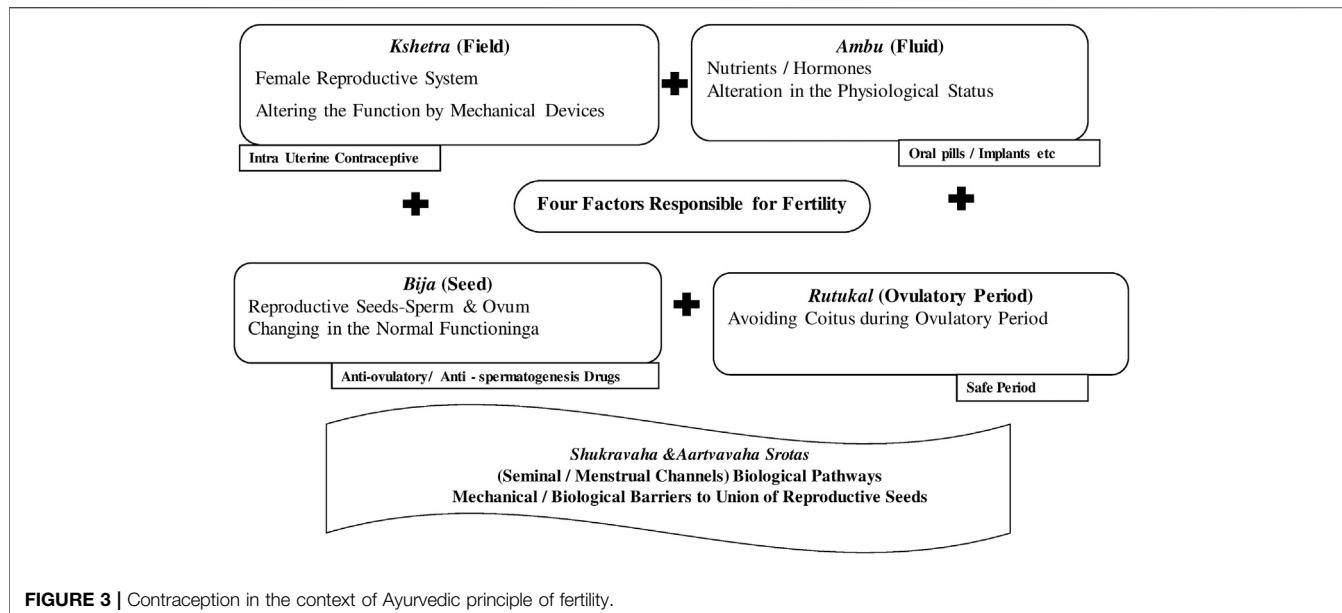


FIGURE 3 | Contraception in the context of Ayurvedic principle of fertility.

indica A. Juss.) before coitus (Tripathi, 1969), and (3) powdered root of *Dhattura* (*Datura metel* L.) plucked on the 14th day (dark night) of the lunar month [Indradev, 1998] or tying the waist with roots (Lakmipatishashtri, 1983).

2. Oral Contraceptives

- Powder of *Pippali* (*Piper longum* L.) and *Vidanga* (*Embelia ribes* Burm.f.) with *Tankana* (*Borax*) taken in equal quantity in fertile phase with milk (Lakmipatishashtri, 1983).
- Flowers of *Japa* (*Hibiscus rosa-sinensis* L.): immediately after the delivery of a child (Bhavamisra, 1961; Lakmipatishashtri, 1983) or with *Kanji* (fermented drink) along with 48 grams of old jaggery to be taken for 3 days in the fertile phase. (Lakmipatishashtri, 1983).
- Root of *Tanduliyaka* (*Amaranthus spinosus* L.) with *Tandulodaka* (rice water) to be taken after menstruation for 3 days. (Lakmipatishashtri, 1983).
- Powders of *Talispa patra* (*Abies spectabilis* (D.Don) Mirb.) and *Gairika* (Red Ochre, Fe_2O_3) in equal parts to be consumed on the 4th day of menstruation with water. (Lakmipatishashtri, 1983).
- Aqueous extract of *Rasanjana* (Extract of *Berberis aristata* DC.), *Hemavati* (Sweta – Vacha) (*Iris × germanica* L.), and *Vayastha* (*Terminalia chebula* Retz.) with cold water. (Rajeshwaradatta, 2001).
- Powders of *Amla* (*Phyllanthus emblica* L.), *Arjuna* (*Terminalia arjuna* (Roxb. ex DC)), and *Abhaya* (*Terminalia chebula* Retz.) with water. (Rajeshwaradatta, 2001).
- Paste made of the root of *Chitraka* (*Plumbago zeylanica* L.) mixed with *Nirgundi* (*Vitex negundo* L.) juice given orally in the dose of one 12 gm with honey. (Lakmipatishashtri, 1983).
- Powder of seeds of *Sarshapa* (*Brassica rapa* L.) with *Tanduliyam* (*Amaranthus spinosus* L.) and *Sarkara*

(Sugar candy) pounded with *Tandulodaka* (rice water) given with milk. (Jugnu and Sharma, 2011).

- Ashes of *Sehund stem* (*Euphorbia nerifolia* L.), 12 g daily. (Kuchimara, 2007).
- Rhizome of *Haridra* (*Curcuma longa* L.) daily during the 3 days of menstruation followed by an additional 3 days (Kuchimara, 2007).
- Powders of *Krishna Jeeraka* (*Carum carvi* L.), *Karchooram* (*Hedychium spicatum* Sm.), *Nagakesara* (*Mesua ferrea* L.), *Haritaki* (*Terminalia chebula* Retz.), *Kalonji* (*Nigella sativa* L.), and *Kayaphala* (*Myrica nagi* Thunb.) made into pills in the size of ziziphus fruit for 7 days. (Kuchimara, 2007).

3. Abortifacient

- Root of *Sweta Aparajita* (*Clitoria ternatea* L.), *Kakadani* (*Sarngesta*) (*Cardiospermum halicacabum* L.) or *Punarnava* (*Boerhavia diffusa* L.) with oil of *Eranda* (*Ricinus communis* L.)—*Patradanda* (stem of leaf) to be inserted in the vagina (Rajamartanda, 1966; Tripathi, 1969; Lakmipatishashtri, 1983).
- *Devalaya Churna* (scrapped lime powder from the wall of temple) 12 g with water. (Lakmipatishashtri, 1983; Indradev, 1998).
- Seeds of *Grnjana* (Carrot) (*Daucus carota* L) with roots of *Tuvari* (*Cajanus cajan* (L.) Huth) and *Sindura* (lead oxide).
- *Ghotipurisa* (feces of mare) mixed with *Kanji*, filtered, and mixed with rock salt, *Ugra* (*Apium graveolens* L.), and *AsuriTaila* (Oil of *Brassica juncea* (L.) Czern.) with *Visha* (*Aconitum chasmanthum* Stapf ex Holmes) (Lakmipatishashtri, 1983).

Plant and mineral drugs mentioned as contraceptives in the Ayurvedic classical texts are given in **Table 1**.

It is observed that 79 plant drugs and six mineral drugs are used as abortifacients, oral contraceptives, or as local applications

TABLE 1 | List of plant and metal drugs as contraceptives in Ayurveda classics. Vertical column numbers indicate *AaartavJanan*—Emmenagogue (1), *Aparapatan*—placental expulsion (2), *Garbhanuloman/Garbhapatkar*—Abortifacient or *Garbhastravakar*—expel Fetus (3), *Garbhanirodhak* Contraceptives (4), *Garbhashayasancochak*—Ecabolic (5), *Shandhyakar/Pumstvopadhatin*—drugs that hamper male sexual or reproductive capability (6), and *Shukrashodhan*—Depurates (7).

Sr. No.	Sanskrit name	Botanical name	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Aguru	<i>Aquilaria malaccensis</i> Lam.			✓					
Ahiphen	<i>Papaver somniferum</i> L.							✓	
Amalaki	<i>Phyllanthus emblica</i> L.					✓			
Ashok	<i>Saraca asoca</i> (Roxb.) J.J.de Wilde		✓				✓		
Asuri	<i>Brassica juncea</i> (L.) Czern				✓				
Arjuna	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.					✓			
Bhang	<i>Cannabis sativa</i> L.							✓	✓
Bhurjapatra	<i>Betula utilis</i> D. Don			✓	✓				
Chandan	<i>Santalum album</i> L.							✓	
Chavya	<i>Piper retrofractum</i> Vahl			✓					
Chirbilva	<i>Holoptelea integrifolia</i> (Roxb.) Planch.					✓			
Chitraka	<i>Plumbago zeylanica</i> L.			✓	✓	✓	✓		
Chuka	<i>Rumex acetosa</i> L.							✓	
Devdaru	<i>Cedrus deodara</i> (Roxb. ex D. Don) G. Don		✓	✓					
Dhanyak	<i>Coriandrum sativum</i> L.							✓	
Dhattura	<i>Datura metel</i> L.						✓	✓	
Ela	<i>Elettaria cardamomum</i> (L.) Maton		✓	✓					
Eranda	<i>Ricinus communis</i> L.				✓				
Eshvari	<i>Aristolochia indica</i> L.				✓			✓	
Grnjana	<i>Daucus carota</i> L.				✓				
Haridra	<i>Curcuma longa</i> L.					✓			
Haritaki	<i>Terminalia chebula</i> Retz.					✓			
Harmal	<i>Peganum harmala</i> L.						✓		
Hemavati	<i>Iris germanica</i> L.					✓			
Hingu	<i>Ferula assa-foetida</i> L.					✓			
Hirabol	<i>Commiphora myrrha</i> (Nees) Engl.							✓	
Japa	<i>Hibiscus rosa-sinensis</i> L.					✓			
Karchuram	<i>Hedychium spicatum</i> Sm.					✓			
Kadamb	<i>Neolamarckia cadamba</i> (Roxb.) Bosser								✓
Kakadani (Sargesta)	<i>Cardiospermum halicacabum</i> L.					✓			
Kakamachi	<i>Solanum nigrum</i> L.							✓	
Karpas	<i>Gossypium herbaceum</i> L.			✓			✓		
Karpur	<i>Cinnamomum camphora</i> (L.) J. Presl							✓	
Kasani	<i>Cichorium intybus</i> L.							✓	
Kayaphala	<i>Myrica nagi</i> Thunb.					✓			
Ketaki	<i>Pandanus tectorius</i> Parkinson ex Du Roi				✓	✓			
Krishna Jeeraka	<i>Carum carvi</i> L.				✓	✓			
Kulattha	<i>Vigna unguiculata</i> (L.) Walp.		✓	✓				✓	
Kushtha	<i>Aucklandia costus</i> Falc		✓	✓	✓				
Langali	<i>Gloriosa superba</i> L.					✓		✓	
Lodhra	<i>Symplocos racemosa</i> Roxb.							✓	
Mandukparni	<i>Centella asiatica</i> (L.) Urb.				✓				
Mocharas	<i>Bombax ceiba</i> L.						✓		
Nagakesara	<i>Mesua ferrea</i> L.						✓		
Nagdamani	<i>Artemisia nilagirica</i> (C. B. Clarke) Pamp.				✓		✓		
Neem	<i>Azadirachta indica</i> A. Juss.						✓		
Nimbu	<i>Citrus x aurantium</i> L.							✓	
Nilophar	<i>Nymphaea alba</i> L.							✓	
Nirgundi	<i>Vitex negundo</i> L.					✓	✓		
Pippali	<i>Piper longum</i> L.				✓		✓		
Punarnava	<i>Boerhavia diffusa</i> L.					✓			
Rasanjana	<i>Berberis aristata</i> DC.						✓		
Rason	<i>Allium cepa</i> L.							✓	
Sarshapa	<i>Brassica rapa</i> L.							✓	
Sehund	<i>Euphorbia nerifolia</i> L.							✓	
Shal-sarjarasa	<i>Shorea robusta</i> Gaertn.			✓					
Shallaki	<i>Boswellia serrata</i> Roxb.							✓	
Shan	<i>Dioscorea polystachya</i> Turcz.			✓					
Shigru	<i>Moringa oleifera</i> Lam.					✓			
Shinshapa	<i>Dalbergia sissoo</i> Roxb. ex DC.					✓			
Shyonak	<i>Oroxylum indicum</i> (L.) Kurz							✓	

(Continued on following page)

TABLE 1 | (Continued) List of plant and metal drugs as contraceptives in Ayurveda classics. Vertical column numbers indicate *AaartavJanan*—Emmenagogue (1), *Aparapatana*—placental expulsion (2), *Garbhanuloman/Garbhapatkar*—Abortifacient or *Garbhastravakar*—expel Fetus (3), *Garbhanirodhak Contraceptives* (4), *Garbhashayasancochak*—Ecabolic (5), *Shandhyakar/Pumstvopadhatin*—drugs that hamper male sexual or reproductive capability (6), and *Shukrashodhan*—Depurates (7).

Sr. No.	Sanskrit name	Botanical name	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	<i>Sitab</i>	<i>Ruta graveolens</i> L.					✓	✓	✓
	<i>Sitaphal</i>	<i>Annona squamosa</i> L.			✓	✓			
	<i>Sunthi</i>	<i>Zingiber officinale</i> Roscoe		✓					
	<i>Sweta Aparajita</i>	<i>Clitoria ternatea</i> L.			✓				
	<i>Talisa patra</i>	<i>Abies spectabilis</i> (D. Don) Mirb.	✓	✓		✓			
	<i>Tanduliyaka</i>	<i>Amaranthus spinosus</i> L.				✓			
	<i>Tintidika</i>	<i>Tamarindus indica</i> L.						✓	
	<i>Tilataila</i>	Sesame oil					✓		
	<i>Tuvari</i>	<i>Cajanus cajan</i> (L.) Huth			✓				
	<i>Ugra</i>	<i>Apium graveolens</i> L.			✓				
	<i>Ulatakambal</i>	<i>Abroma augusta</i> (L.) L.f.	✓				✓		
	<i>Unnab</i>	<i>Ziziphus jujuba</i> Mill.						✓	
	<i>Upakunchika</i>	<i>Nigella sativa</i> L.		✓		✓	✓		
	<i>Ushir</i>	<i>Chrysopogon zizanioides</i> (L.) Roberty							✓
	<i>Vacha</i>	<i>Acorus calamus</i> L.			✓				
	<i>Vansha</i>	<i>Bambusa bambos</i> (L.) Voss	✓					✓	
	<i>Vidanga</i>	<i>Embelia ribes</i> Burm.f.	✓	✓		✓			
	<i>Visha</i>	<i>Aconitum chasmantum</i> Stapf ex Holmes			✓				
Minerals/Metals									
	<i>Devalaya Churna</i>	Scrapped lime powder from the wall of temple					✓		
	<i>Gairika</i>	<i>Red Ochre, Fe₂O₃</i>					✓		
	<i>Nausagar</i>	<i>NH₄Cl</i>						✓	
	<i>Saindhava lavana</i>	Rock salt					✓		
	<i>Sindura</i>	Lead oxide					✓		
	<i>Tankana</i>	Borax					✓		

along with *Kanji* (fermented drink), *Tandulodaka* (rice water), *Sarkara* (sugar candy), milk, and honey.

POTENTIAL INGREDIENTS HAVING ANTIFERTILITY OR CONTRACEPTIVE PROPERTIES

This literature survey revealed that there are about more than 94 indigenous medicinal plants having scientific evidence of acting as contraceptives. Some of the remarkable plant drugs with parts used, their chemical constituents, and pharmacological activities are described in Table 2. This compiled information will provide useful reference for new drug designing models, acting either as male or female contraceptives.

Pharmacologically, there are about 67 medicinal plants which possess antifertility activity in females and 56 medicinal plants in males. Several plants have shown to help contraception from the female and male perspectives.

In various experimental animal models, these herbal extracts have shown minimal side effects in comparison to the chemically synthesized contraceptives, which usually contain various combinations of hormones. These plant extracts have active phytoconstituents, which are responsible for the antifertility effects such as antiovulation, anti-implantation, and others.

CLINICAL STUDIES

Some of the plants that have demonstrated interesting antifertility activity in clinical trials are as follows.

Embelia ribes Burm.f.

Single drug was administered in a dose of 2°g for 5°days followed by 1°g daily for another 10°days. After observing the effect on 2051 cycles in 45 women over 4°years, it was reported that the plant protected 95% of women from pregnancy (Tewari et al., 1976).

Hibiscus rosa-sinensis L.

Red petals of the plant *Rudrapushpaka* collected between October and December. The extract was administered to 30 sexually active women at a dose of 750°mg/day from day 7 to day 22 of the reproductive cycle. It was observed that no one had become pregnant (Tewari, 1974).

Neem oil

A study was conducted on neem seed oil as local application for the reproductive female [246 women in the fertile age-group, 4 dropped out] as a method of family planning for a period of 12–36 cycles. In nine cases, there was conception due to drug failure and in four cases, there was conception due to drug omission. Neem seed oil may be used as an external barrier as

TABLE 2 | Medicinal plants and their phytoconstituents validated for various female/male contraceptive activities. Different contraceptive activities studied on medicinal plants could be categorized as follows. Female contraceptive activities: (2A) anti-implantation activity, (2B) abortification, (2C) antifertility, (2D) antiovulatory, and (2E) antiestrogenic activity. Male contraceptive activities: (2F) antispermaticogenic, (2G) spermicidal, and (2H) antiandrogenic activity.

Sr. No.	Botanical name, family, Sanskrit name, parts	Chemical composition	Extract	Mode of action in experimental studies	Reference
A Anti-implantation activity					
1.	<i>Abies spectabilis</i> (D. Don) Mirb. Pinaceae Talisa Patra, leaf	Flavonoids, bioflavonoids, glycosides, phytosterols	Benzene, alcoholic	Anti-implantation activity	Anonymous (1996)
2.	<i>Abroma augusta</i> (L.) L.f. Malvaceae Pishach karpas, roots	L-rhamnose, L-arabinose, D-xylose, D-mannose, D-galactose, D-glucose, D-galacturonic acid, and D-glucuronic acid	Alcoholic	Anti-implantation	Maurya et al. (2004), Pokharkar et al. (2010), Kalita et al. (2011)
3.	<i>Adhatoda vasica</i> Nees synonym of <i>Justicia adhatoda</i> L. Acanthaceae Vasa, leaves	Alkaloids, tannins, saponins, and phenolics flavonoids	Aqueous	Anti-implantation	Pokharkar et al. (2010); Kaur et al. (2011); Raj et al. (2011)
4.	<i>Ailanthus excelsa</i> Roxb Simaroubaceae Maharukha, leaves	Sitosterol, quassinooids, and ailantic acid	Ethanol	Anti-implantation decreased of implant sites	Priya et al. (2012); Tamboli and Konadawar (2013)
5.	<i>Allium cepa</i> L. Amaryllidaceae Palandu, onion, bulb	Kampferol, β-sitosterol, ferulic acid, and myritic acid	Ethanol	Anti-implantation inhibition of implant sites	Thakare et al. (2009); Ola-Mudathir et al. (2008)
6.	<i>Aloe barbadensis</i> Mill. Synonym of <i>aloe vera</i> (L.) Burm.f. Asphodelaceae Kumari, leaves	Water, polysaccharides, pectin, cellulose, hemicellulose, and glucomannan	Ethanol and aqueous	Anti-implantation	Shah et al. (2017), Shah et al. (2016)
7.	<i>Areca catechu</i> L. Arecaceae Poogaphala, Nuts	Alkaloids—pilocarpine, arecaidine, and arecoline	Petroleum ether, alcoholic, and aqueous	Anti-implantation	Garg and Garg (1970); Garg and Garg (1971)
8.	<i>Cassia fistula</i> L. Fabaceae Aragvadha, fruits, bark	Alkaloid	Aqueous	Anti-implantation, decreased glycogen content in uterus, and antifertility	Yadav and Jain (2009)
9.	<i>Carica papaya</i> L. Caricaceae, Papaya unripe fruit pulp, seeds, latex	Papain, caricacin, carpasemine, and oleanolic glycoside	Pet ether, alcohol, and aqueous ethanol	60 % anti-implantation activity, abortifacient in albino rats	Garg and Garg (1970); Garg and Garg (1971); Das (1980); Sinha and Nathawat (1989); Changamma and Lakshman (2013)
10.	<i>Centratherum anthelminticum</i> (L.) Gamble Asteraceae Vanya Jeeraka, seeds	Glycosides, carbohydrates, phenolic compounds, tannins, flavonoids, proteins, saponins, and sterols	Ethanol	Postcoital anti-implantation activity	Sharma et al. (1994)
11.	<i>Citrus × aurantium</i> L Rutaceae Bijaura, seeds	Citroflavanoids, glucosides, and triterpenoids	Petroleum ether	Anti-implantation, antiovulatory, abortifacients increased ovarian weight, decreased Graafian follicles, and irregular estrous cycle	Patil and Patil (2013)
12.	<i>Embelia ribes</i> Burm.f. Primulaceae Vidang, berries	Embelin, volatile oil, and fixed oil	Isolated embelin	Anti-implantation and postcoital antifertility activity	Prakash (1981); Nand (1981); Dixit and Joshi (1983)

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TABLE 2 | (Continued) Medicinal plants and their phytoconstituents validated for various female/male contraceptive activities. Different contraceptive activities studied on medicinal plants could be categorized as follows. Female contraceptive activities: (2A) anti-implantation activity, (2B) abortification, (2C) antifertility, (2D) antiovulatory, and (2E) antiestrogenic activity. Male contraceptive activities: (2F) antispermaticogenic, (2G) spermicidal, and (2H) antiandrogenic activity.

Sr. No.	Botanical name, family, Sanskrit name, parts	Chemical composition	Extract	Mode of action in experimental studies	Reference
13.	<i>Gloriosa superba</i> L. Colchicaceae Langli Root	Colchicine (superbine)	Hydroalcoholic extract at two different doses	Antifertility, anti-implantation activity in postcoital study, abortifacient activity	Latha et al. (2013)
14.	<i>Grewia asiatica</i> L. Malvaceae, seeds	Potassium, calcium, phosphorus, copper, zinc, and magnesium	Aqueous	Anti-implantation and abortification activity	Kamboj and Dhawan (1982)
15.	<i>Hibiscus rosa-sinensis</i> L. Malvaceae Japa Flowers	Cyclopeptide alkaloid	Ethanol and benzene extract	Anti-implantation, antiovulatory, increased uterine weight, secretion of estrogenic by atretic follicles, postcoital antifertility	Neeru and Sharma (2008); Vasudeva and Sharma (2008); Hadimur et al. (2014), Pal et al. (1985)
16.	<i>Mesua ferrea</i> L. Calophyllaceae Nagakeshara, flowers	Mesuol, mammegin, mesuaferronea, and mammeuisin	Aqueous	Anti-implantation activity	Seshadri and Pillai (1981); Munshi et al. (1977)
17.	<i>Michelia champaca</i> L. Magnoliaceae Champaka, Anthers	Essential oil	Benzene and hydroalcoholic extract	Postcoital anti-implantation activity	Sharma et al. (1994); Taprial et al. (2013)
18.	<i>Momordica charantia</i> L. Cucurbitaceae Karwellaka roots, leaves	Glycosides, saponins, alkaloids, fixed oils, triterpenes, proteins, and steroids	Aqueous	Uterine stimulant activity, Antifertility, estrogenic activity	Jamwal and Anand (1962); Saksena (1971)
19.	<i>Plumbago zeylanica</i> L. Plumbaginaceae Chitrak, root	Plumbagin	Plumbagin-free alcohol	Anti-implantation and abortifacient activity	Gupta et al. (2011)
20.	<i>Ricinus communis</i> L. Euphorbiaceae Erand, castor bean Seed	Ricinine and isoquinoline	Aqueous	Anti-implantation, increase in diameter of the uterus, and decrease in uterine hormones	Makonnen et al. (1999)
21.	<i>Rubia cordifolia</i> L. Rubiaceae Manjishta Root	Munjistin, purpurin, and pseudopurpurin	Ethanolic extract	Anti-implantation	Maurya et al. (2004)
22.	<i>Sapindus trifoliatus</i> L. Sapindaceae Arishtak Fruits, pulp, and seeds	Essential oil	Butanol	Antizygotic, blastocytotoxic, or anti-implantation activity	Pal et al. (2013); Bodhankar et al. (1974)
23.	<i>Sesbania sesban</i> (L.) Merr. Fabaceae Sesban Leaves	Alkaloids, flavonoids, glycosides, tannin, anthraquinone, steroid, phlobatannins, and terpenoids	Extract and powder	Inhibit the ovarian function, change the uterine structure, and prevent the implantation	Singh (1990a); Samajdar and Ghosh (2017)
B Abortification activity					
1.	<i>Abroma augusta</i> (L.) L.f. Malvaceae <i>Pishach karpas</i> , roots	L-rhamnose, L-arabinose, D-xylose, D-mannose, D-galactose, D-glucose, D-galacturonic acid, and D-glucuronic acid	Alcoholic	Abortification activity	Pokharkar et al. (2010); Kalita et al. (2011)

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TABLE 2 | (Continued) Medicinal plants and their phytoconstituents validated for various female/male contraceptive activities. Different contraceptive activities studied on medicinal plants could be categorized as follows. Female contraceptive activities: (2A) anti-implantation activity, (2B) abortification, (2C) antifertility, (2D) antiovulatory, and (2E) antiestrogenic activity. Male contraceptive activities: (2F) antispermaticogenic, (2G) spermicidal, and (2H) antiandrogenic activity.

Sr. No.	Botanical name, family, Sanskrit name, parts	Chemical composition	Extract	Mode of action in experimental studies	Reference
2.	<i>Abrus precatorius</i> L. Papilionaceae Gunga, Seeds	Abelin, abrasine, precasine, and precol	Aqueous	Abortifacient activity or antifertility agent with a risk of DNA damage	Sarwat et al. (2009); Kaur et al. (2011); Shrivastava et al. (2007); Azmeera et al. (2012); Priya et al. (2012)
3.	<i>Achyranthes aspera</i> L. Amaranthaceae <i>Apamarga</i> Whole plant, Stem bark, Root	Fatty acids, oleonic acid, bisdesmosidic, triterpenoid alkaloids, D-glucuronic, betaine, and achyranthine	Benzene, ethanolic, and chloroform	Abortifacient activity in rabbits	Raj et al. (2011); Vasudeva and Sharma (2006)
4.	<i>Adhatoda vasica</i> Nees synonym of <i>Justicia adhatoda</i> L. Acanthaceae, Vasa, Leaves	Alkaloids, tannins, saponins, phenolics, and flavonoids	Aqueous	Abortification activity	Pokharkar et al. (2010); Kaur et al. (2011); Raj et al. (2011)
5.	<i>Aegle marmelos</i> (L.) Corrêa. Rutaceae <i>Bilva</i> , whole plant, leaves	Marmelosin, luvangetin, psoralen, tannins, and marmin	Aqueous extract	Abortifacient activity in albino rats	Gangadhar and Lalithakumari (1995); Sathiyaraj et al. (2010)
6.	<i>Annona squamosa</i> L. Annonaceae <i>Custard apple</i> Seeds, leaves, and bark	Atropine alkaloids, and anonaine	Ethyl acetate extract	Abortifacient induces early abortion	Jain and Dixit (1992)
7.	<i>Areca catechu</i> L. Arecaceae <i>Poogaphala</i> , nuts	Alkaloids—pilocarpine, arecaidine, and arecoline	Petroleum ether, alcoholic, and aqueous	Abortifacient activity in albino rats and antifertility activity	Garg and Garg (1970); Garg and Garg (1971); Shrestha et al. (2010)
8.	<i>Barleria prionitis</i> L. Acanthaceae <i>Saireyak</i> , Roots	Acbarlerin, barlerin, β -sitosterol, flavanol glycoside, and iridoids	Methanol extract	Abortifacient	Gupta et al. (2000)
9.	<i>Carica papaya</i> L. Caricaceae <i>Papaya</i> unripe fruit pulp, seeds, and latex	Papain, caricacin, carpasemine, and oleanolic glycoside,	Pet ether, alcohol, and aqueous ethanol	Abortifacient in albino rats and antifertility	Garg and Garg (1970), Garg and Garg (1971); Das (1980); Sinha and Nathawat (1989); Changamma and Lakshman (2013)
10.	<i>Citrus × aurantium</i> L. Rutaceae <i>Bijaura</i> , Seeds	Citroflavonoids, glucosides, and triterpenoids	Petroleum ether	Abortifacient, increased ovarian weight, decreased Graafian follicles, and irregular estrous cycle	Patil and Patil (2013)
11.	<i>Daucus carota</i> L. Apiaceae <i>Grinjanak</i> , seed	Essential oil	Petroleum, ether, benzene, alcohol, and water	Abortifacient activity	Garg (1975); Jansen and Wolhlmuth (2014); Shah and Varute (1980)
12.	<i>Gloriosa superba</i> L. Colchicaceae <i>Langli</i> Root	Carbohydrates, flavonoids, steroids, alkaloids, tannins, and glycosides	Ether, chloroform, and ethyl alcohol extracts	Abortifacient activity and significant reduction in number of implants and number of pups born	Malpani and Mahurkar (2018)
13.	<i>Grewia asiatica</i> L. Malvaceae, seeds	Potassium, calcium, phosphorus, copper, zinc, and magnesium	Aqueous	Abortification activity	Kamboj and Dhawan (1982)
14.	<i>Lepidium sativum</i> L. Brassicaceae <i>Chandrasur</i> Mature explants	Lepidine	Methanolic	Abortifacient and antiovulatory	Pande et al. (2002)

(Continued on following page)

TABLE 2 | (Continued) Medicinal plants and their phytoconstituents validated for various female/male contraceptive activities. Different contraceptive activities studied on medicinal plants could be categorized as follows. Female contraceptive activities: (2A) anti-implantation activity, (2B) abortification, (2C) antifertility, (2D) antiovulatory, and (2E) antiestrogenic activity. Male contraceptive activities: (2F) antispermaticogenic, (2G) spermicidal, and (2H) antiandrogenic activity.

Sr. No.	Botanical name, family, Sanskrit name, parts	Chemical composition	Extract	Mode of action in experimental studies	Reference
15.	<i>Ricinus communis</i> L. Euphorbiaceae <i>Erand</i> , Castor bean Seed	Ricinine and isoquinoline	Aqueous extract	Abortifacient	Makonen et al. (1999), Sandhyakumary et al. (2003)
16.	<i>Woodfordia fruticosa</i> (L.) Kurz Lythraceae <i>Dhatki</i> , flowers	Tannins, flavonoids, anthraquinone glycosides, and polyphenols	Aqueous and ethanol	Abortifacient	Pathak et al. (2005)
C Antifertility activity					
1.	<i>Abrus precatorius</i> L. Papilionaceae <i>Gunga</i> , Seeds	Abrin, abrasine, precasine, and precol	Aqueous	Antifertility agent with a risk of DNA damage	Sarwat et al. (2009); Kaur et al. (2011); Shrivastava et al. (2007); Azmeera et al. (2012); Priya et al. (2012)
2.	<i>Acacia leucophloea</i> (Roxb.) Willd. Leguminosae—Fabaceae <i>Shwet babul</i> , roots	N-hexacosanol, beta-amyrin, beta-sitosterol, and tannin	Alcoholic	Antifertility activity	Dheeraj (2011)
3.	<i>Annona squamosa</i> L. Annonaceae <i>Custard apple</i> Seeds, leaves, and bark	Atropine alkaloids and anonaiae	Ethyl acetate extract	Abortifacient—induces early abortion	Jain and Dixit (1992)
4.	<i>Areca catechu</i> L. Arecaceae <i>Poogaphala</i> , Nuts	Alkaloids—pilocarpine, arecaidine, and arecoline	Nut oil Ethanolic extract	Antifertility activity in female albino rats, antiovulatory, and ovarian weight decreased due to imbalance in gonadotrophins	Garg et al. (1974); Shrestha et al. (2010)
5.	<i>Azadirachta indica</i> A. Juss Meliaceae <i>Nimba</i> Leaves, flower, and seed	Azadirachtin, nimbozin, nimbin, nimbidin, nimbidol, sodium nimbinate, and gedunin	Female albino rabbits Seed oil	Antifertility and functional sterility	Vyas and Purohit (2018)
6.	<i>Carica papaya</i> L. Caricaceae Papaya unripe fruit pulp, seeds, and latex	Papain, cariacin, carpasemine, and oleanolic glycoside	Pet ether, alcohol, aqueous, and ethanol	Antifertility	Garg and Garg (1970); Garg and Garg (1971); Das (1980); Sinha and Nathawat (1989); Changamma and Lakshman (2013)
7.	<i>Cissampelos pareira</i> L. Menispermaceae, <i>Patha</i> Leaves and stem	Berberine	Leaf extract	Altered the estrous cycle pattern in female mice, Antifertility	Ganguly et al. (2007); Samatha et al. (2011)
8.	<i>Cuminum cyminum</i> L. Apiaceae <i>Jeerak</i> , seeds	Cuminal and cuminic alcohol	Extract	Antifertility effect in female albino rat	Priya et al. (2012); Sharma J et al. (2001)
9.	<i>Crateva nurvala</i> Buch-Ham. Capparaceae <i>Varuna</i> Dried stem bark	Alkaloids, triterpene, tannins, saponins, flavonoids, sterols, glucosylinate, lupeol, and diosgenin	Ethanol, aqueous	Antifertility effects estrogenic activity	Bhaskar et al. (2009)
10.	<i>Curcuma longa</i> L. Zingiberaceae <i>Haldi</i> , rhizome	Curcumin and flavonoids	Ethanol, aqueous	Propylene glycol solution, antifertility, antiovulatory—suppression of GnRH	Ghosh et al. (2011); Bhagat and Purohit (1986)

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TABLE 2 | (Continued) Medicinal plants and their phytoconstituents validated for various female/male contraceptive activities. Different contraceptive activities studied on medicinal plants could be categorized as follows. Female contraceptive activities: (2A) anti-implantation activity, (2B) abortification, (2C) antifertility, (2D) antiovulatory, and (2E) antiestrogenic activity. Male contraceptive activities: (2F) antispermaticogenic, (2G) spermicidal, and (2H) antiandrogenic activity.

Sr. No.	Botanical name, family, Sanskrit name, parts	Chemical composition	Extract	Mode of action in experimental studies	Reference
11.	<i>Daucus carota</i> L. Apiaceae <i>Grinjanak</i> , Seed	Essential oil	Petroleum, ether, benzene, alcohol, and water	Antifertility activity	Garg (1975); Jansen and Wolhlmuth (2014); Shah and Varute (1980)
12.	<i>Desmodium gangeticum</i> (L.) DC. Fabaceae <i>Shaljaparni</i> , Root	Lavonoid glycosides, pterocarpanoids, lipids, glycolipids, and alkaloids	Gangeticum	Antifertility effect	Pillai et al. (1982)
13.	<i>Embelia ribes</i> Burm.f. Primulaceae <i>Vidang</i> , Berries	Embelin, volatile oil, fixed oil, resin, tannin, christembine (alkaloid), and phenolic acids	Isolated embelin	Anti-implantation and postcoital antifertility activity	Prakash (1981b)
14.	<i>Ferula jaeschkeana</i> Vatke Apiaceae <i>Heengupatri</i> , Dried leaves	Flavonoids, alkaloids, terpenoids, cardiac glycosides, saponins, and phenolics	Hexane	Duration-dependent luteolytic changes in the corpora lutea	Pathak et al. (1995)
15.	<i>Gloriosa superba</i> L. Colchicaceae <i>Langli</i> , Root	Colchicine (superbine)	Hydroalcoholic extract at two different doses 30 and 60 mg/kg	Antifertility, anti-implantation activity in postcoital study	Latha et al. (2013)
16.	<i>Hibiscus rosa-sinensis</i> L. Malvaceae <i>Japa</i> , Flowers	Cyclopeptide alkaloid	Ethanol and benzene extract	Anti-implantation, antiovulatory, secretion of estrogenic by atretic follicles, and postcoital antifertility	Neeru and Sharma (2008)
17.	<i>Lawsonia inermis</i> L. Lythraceae <i>Madayantika</i> , Leaves	Lawsone, esculetin, fraxetin, isoplumbagin, scopoletin, betulin, betulinic acid, hennadiol, lupeol, lacoumarin, quinone, and napthaquinone	Powder	Preventing pregnancy in 60% of the animals tested	Munshi et al. (1977)
18.	<i>Lepidium sativum</i> L. Brassicaceae <i>Chandrasur</i> , Mature explants	Lepidine	Methanolic	Abortifacient and antiovulatory	Pande et al. (2002)
19.	<i>Melia azedarach</i> L. <i>Meliaceae</i> , <i>Mala/Vembu</i> seed and leaves	Triterpenoids	Seed extract	Antifertility effect, increased preimplantation, postimplantation, and total prenatal mortalities	Mandal and Dhariwal (2007)
20.	<i>Momordica charantia</i> L. Cucurbitaceae <i>Karwellaka</i> , Roots and leaves	Glycosides, saponins, alkaloids, fixed oils, triterpenes, proteins, and steroids	Aqueous	Uterine stimulant activity, antifertility, and estrogenic activity	Jamwal and Anand (1962); Saksena (1971)
21.	<i>Nigella sativa</i> L. Ranunculaceae <i>Krishna jeerak</i> , Seeds	Fixed oil, volatile oil, and alkaloids	Hexane	Antifertility activity in rats, postcoital contraceptive	Keshri et al. (1995)
22.	<i>Piper betle</i> L. Piperaceae <i>Betel leaf, Pan</i> , Petiol	Eugenol, eugenol acetate, piper betol, piperol, and methyl eugenol phytol	Alcoholic	Antifertility, antiestrogenic effects in female rats	Sharma et al. (2007)
23.	<i>Piper longum</i> L. Piperaceae <i>Pippali</i> , Root and ruitis	Piperine	Powder, hexane fraction, and benzene	Antifertility activity—prolonged the length of the extort cycle, drastic reduction in the number of implantation sites, marked suppression in the ovarian cytokines and nitric acid level	Laxmi et al. (2006); Kholkute et al. (1979)

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Sr. No.	Botanical name, family, Sanskrit name, parts	Chemical composition	Extract	Mode of action in experimental studies	Reference
24.	<i>Trichosanthes cucumerina</i> L. Cucurbitaceae <i>Snake gourd, Fruit</i>	Cucurbitacin B, cucurbitacin E, isocucurbitacin B, E, sterols 2 β -sitosterol stigmasterol	Aqueous	Affected the normal estrous cycle, significantly reduced the number of healthy follicles, corpora lutea, and increased the number of regressing follicles. Reduced serum FSH and LH levels	Devendra et al. (2009)
25.	<i>Zingiber officinale</i> Roscoe Zingiberaceae <i>Sunthi</i> Rhizome	Monocyclic, phenols, sesquiterpenes sential oil, oleoresins, and proteolytic enzymes	Aqueous, ethanol extracts	Antifertility activity	Pathak et al. (2005)
D Antiovulatory activity	<i>Achyranthes aspera</i> L. Amaranthaceae <i>Apamarga</i> Whole plant, Stem bark, Root	Fatty acids, oleonic acid, bisdesmosidic, triterpenoid alkaloids, D-glucuronic, betaine, and achyranthine	Benzene, ethanolic, chloroform	Antiadulatory, anti-implantation, hormonal disturbance in uterus, and expulsion of ovary	Shibeshi et al. (2006); Vasudeva and Sharma (2006)
	<i>Areca catechu</i> L. Arecaceae <i>Poogaphala, Nuts</i>	Alkaloids—pilocarpine, arecaidine, and arecoline	Ethanolic extract	Antiovulatory, ovarian weight decreased due to imbalance in gonadotrophins	Shrestha et al. (2010)
	<i>Azadirachta indica</i> A. Juss. Meliaceae <i>Nimba</i> Leaves, flower, and seed	Azadirachtin, nimbozin, nimbin, nimbidin, nimbolid, sodium nimbinate, and gedunin	Alcoholic extract flower in Sprague-Dawley rats	Disrupted the estrous cycle and caused a partial block in ovulation	Gbotolorun et al. (2003); Vyas and Purohit (2018)
	<i>Butea monosperma</i> (Lam.) Kuntze Fabaceae Palash, bark, and flowers	Kino-tannic acid, gallic acid, and pyrocatechin	Aqueous extract	Inhibit ovulation	Shrivastava et al. (2007), Sinha and Nathawat (1989)
	<i>Calotropis procera</i> (Aiton) W.T. Aiton Apocynaceae <i>Arka, Root</i>	Steroidal alkaloid	Calotropin, aqueous ethanol	Antiovulatory prolonged di-estrous stage with temporary inhibition of ovulation	Gupta et al. (1990); Abdalgader and Elsheikh (2018); Sharma and Jacob (2001a); Pokharkar et al. (2010)
	<i>Catunaregam spinosa</i> (Thunb.) Tirveng. Rubiacae <i>Madanphal,</i> Fruits, seeds, and pulp	Saponins, valeric acid resin, wax, and coloring matter	Ethanolic extract, isolated oleic acid	Antiovulatory effect in rabbits, antiimplantation activity in albino rats	Malhi and Trivedi (1972); Pillai et al. (1977)
	<i>Citrus × aurantium</i> L. Rutaceae <i>Bijaura, Seeds</i>	Citroflavanoids, glucosides, and triterpenoids	Petroleum ether	Anti-implantation, antiovulatory, abortifacient, increased ovarian weight, decreased Graafian follicles, irregular estrous cycle	Patil and Patil (2013)
	<i>Curcuma longa</i> L. Zingiberaceae <i>Haldi, rhizome</i>	Curcumin and flavonoids	Ethanol, aqueous	Propylene glycol solution antifertility, antiovulatory, decreased ovarian weight, suppression of GnRH	Ghosh et al. (2011)
	<i>Hibiscus rosa-sinensis</i> L. Malvaceae <i>Japa, Flowers</i>	Cyclopeptide alkaloid	Ethanol, benzene extract	Anti-implantation, antiovulatory, increased uterine weight, secretion of estrogenic by atretic follicles, postcoital antifertility	Neeru and Sharma (2008)

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TABLE 2 | (Continued) Medicinal plants and their phytoconstituents validated for various female/male contraceptive activities. Different contraceptive activities studied on medicinal plants could be categorized as follows. Female contraceptive activities: (2A) anti-implantation activity, (2B) abortification, (2C) antifertility, (2D) antiovulatory, and (2E) antiestrogenic activity. Male contraceptive activities: (2F) antispermaticogenic, (2G) spermicidal, and (2H) antiandrogenic activity.

Sr. No.	Botanical name, family, Sanskrit name, parts	Chemical composition	Extract	Mode of action in experimental studies	Reference
10.	<i>Musa paradisiaca</i> L. Musaceae, Banana, stem	Alkaloids and flavonoids	Ethanol	Antiovulatory suppressed ovulation due to inhibition in secretion of GnRH	Soni et al. (2013)
11.	<i>Papaver somniferum</i> L. Papaveraceae <i>Ahiphen</i> , Latex	Noscapine alkaloid	Alcoholic extract	Antiovulatory decreased production of gonadotrophin	Kumar and Sachin (2013)
12.	<i>Plumbago rosea</i> L. Plumbaginaceae <i>Raktachitrak</i> , Leaves	Plumbagin, sitosterol glycoside, tannins, and fatty alcohol	Acetone, ethanol	Antiovulatory inhibition of ovulation with irregular estrous cycle	Sheeja et al. (2011)
13.	<i>Semecarpus anacardium</i> L.f. Anacardiaceae <i>Bhallatak</i> Fruits	Alkaloids	Aqueous and ethanol	Reversible antiovulatory activity	Sushma et al. (2016)
14.	<i>Taxus baccata</i> L. Taxaceae <i>Talishpatra</i> Common Yew Leaves	Pseudo alkaloids	Leaf extract	Antiovulatory, inhibited secretion of ovarian hormones	Priya et al. (2012); Kaur et al. (2011)
15.	<i>Vitex negundo</i> L. Lamiaceae <i>Nirgundi</i> , roots, and seeds	Casticin, isoorientin, chrysophenol D, luteolin, p-hydroxybenzoic acid, and D-fructose	Aqueous	Antiovulatory activity	Lal et al. (1992)
E Antiestrogenic activity					
1.	<i>Allium sativum</i> L. Amaryllidaceae <i>Rason</i> , Bulb	Sulfur-containing compounds	Alcohol	Ecobolic in mice and rats, estrogenic activity in female albino rats	Tewari et al. (1971); Ola-Mudathir et al. (2008)
2.	<i>Cyperus rotundus</i> L. Cyperaceae <i>Musta</i> , Rhizome	Cyperene, humulen, selinene, zierone, campholenicopaene, and limonene	Aqueous	Antiestrogenic property	Gediya et al. (2011)
3.	<i>Glycyrrhiza glabra</i> L. Fabaceae <i>Yashtimadhu</i> , Roots	Triterpene glycyrrhizin acid and glycoside	Water	Estrogenic activity	Ahmad et al. (2011)
4.	<i>Guilandina bonduc</i> L. sy. <i>Caesalpinia bonduc</i> (L.) Roxb. Leguminosae <i>Karanja</i> , seeds	Phytosterin, β -sitosterol, flavonoids, bonducillin, aspartic acid, arginine, and citrulline β -carotene	Aqueous	Antiestrogenic activity	Salunke et al. (2011)
5.	<i>Nelumbo nucifera</i> Gaertn. Nelumbonaceae <i>Kamala</i> , Lotus Seeds	Hydrocarbons	Ethanol extract	Antiestrogenic, decreased ovarian weight, estrogens inhibition	Mutreja et al. (2008)
6.	<i>Sesamum indicum</i> L. Pedaliaceae <i>Tila</i> , seeds	Oil, protein, and carbohydrate	Extract	Estrogenic effect in female albino rats	Priya et al. (2012)
7.	<i>Vitex negundo</i> L. Lamiaceae <i>Nirgundi</i> , roots and seeds	Casticin, isoorientin, chrysophenol D, luteolin, p-hydroxybenzoic acid, and D-fructose	Aqueous	Antiovulatory activity	Lal et al. (1992)

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Sr. No.	Botanical name, family, Sanskrit name, parts	Chemical composition	Extract	Mode of action in experimental studies	Reference
F Antispermaticogenic activity					
1.	<i>Abrus precatorius</i> L. Papilionaceae <i>Gunga</i> , seeds	Abisin, abrasine, precasine, and precol	Aqueous	Reduced sperm motility, density, antispermaticogenic effect, reduced activity of testicular enzyme, post-testicular antifertility effect	Bajaj et al. (1981); Dixit et al. (1987); Kulshreshtha and Mathur (1990); Sinha (1990)
2.	<i>Aegle marmelos</i> (L.) Corrêa Rutaceae <i>Bilva</i> , whole plant and leaves	Marmelosin, luvangetin, psoralen, tannins, and marmarin	Aqueous extract	Inhibit spermatogenesis and sperm motility male rat reproduction, affecting the sexual behavior and epididymal sperm concentration	Sur et al. (1999); Sur et al. (2002)
3.	<i>Albizia lebbeck</i> (L.) Benth. Fabaceae <i>Shirish</i> , Pods	Melacacidin, D-catechin, β -sitosterol, albiziahexoside, betulinic acid, and echinocystic acid glycosides	Methanolic extract	Spermatogenic arrest in male albino rats	Gupta et al. (2004); (Gupta et al. 2005a)
4.	<i>Andrographis paniculata</i> (Burm.f.) Nees Acanthaceae <i>Kirattikta</i> , leaves	Andrographolide, Andrographidoids A, B, C, D, E, diterpenoid, and lactone	Water extract	Antispermaticogenic	Akbarsha et al. (1990); Akbarsha and Murugaian (2000)
5.	<i>Ananas comosus</i> (L.) Merr. Bromeliaceae <i>Custard apple</i> , seeds	Atropine alkaloids and anonaiae	Water	Antispermaticogenic activity	Satyawati (1983)
6.	<i>Annona squamosa</i> L. Annonaceae <i>Custard apple</i> Seeds, leaves, and bark	Atropine alkaloids and anonaiae	Ethyl acetate extract	Antispermaticogenic activity	Jain and Dixit (1992)
7.	<i>Areca catechu</i> L. Arecaceae <i>Poogaphala</i> , Nuts	Alkaloids—pilocarpinearecaidine, arecoline	Water	No abnormality in Leydig cell and interstitium tissue	Ave Olivia et al. (2020)
8.	<i>Aristolochia indica</i> L. Aristolochiaceae <i>Ishwari</i> , roots	Aristolochic acid, ceryl alcohol, β -sitosterol, stigmast-4-en-3-one, friedelin, and cycloecalenol	Aristolochic acid	Antispermaticogenic	Gupta et al. (1996)
9.	<i>Azadirachta indica</i> A. Juss. Meliaceae <i>Nimba</i> Leaves, flower, and seed	Azadirachtin, nimbinolin, nimbin, nimbidin, nimbidol, sodium nimbinate, and gedunin	Aqueous, alcoholic	Decrease in the weight of seminal vesicles, ventral prostate, reduction in epithelial height, nuclear diameter, and the secretory materials in the lumen	Gediya et al. (2011)
10.	<i>Bacopa monnieri</i> (L.) Wettst. Plantaginaceae <i>Brahmi</i> , whole plant	Bacosides and saponins	Aqueous extract	Reversible suppression of spermatogenesis and fertility, without producing apparent toxic effects	Singh et al. (2013)
11.	<i>Balanites roxburghii</i> Planch. Zygophyllaceae <i>Ingudi</i> , Fruit pulp	Saponin, furanocoumarin, and flavonoid	Methanol, palmitine hydroxide	Antispermaticogenic activity	Dixit et al. (1981), Agarwal and Dixit (1982)
12.	<i>Berberis aristata</i> DC. Berberidaceae <i>Daruharidra</i> , Roots	Berberine and berbamine	Palmitine hydroxide	Antispermaticogenic action	Gupta and Dixit (1989)

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13.	<i>Butea monosperma</i> (Lam.) Kuntze Fabaceae Palash, bark, and flowers	Kino-tannic acid, gallic acid, and pyrocatechin	Aqueous extract	Antispermaticogenic effect	Wati and Verute (1988)
14.	<i>Calotropis procera</i> (Aiton) W.T. Aiton Apocynaceae Arka, root	Steroidal alkaloid	Calotropin, aqueous ethanol	Antispermaticogenic, antiandrogenic activities, and/or endocrine disrupting effects, functional alteration in genital organ	Gupta et al. (1990); Abdalgader and Elsheikh (2018); Sharma and Jacob (2001b); Pokharkar et al. (2010)
15.	<i>Carica papaya</i> L. Caricaceae Papaya, unripe fruit pulp, seeds, latex	Papain, caricacin, carpasemine, oleanolic glycoside,	Pet ether, Alcohol, aqueous Ethanol	Antispermaticogenic activity reduced spermatogenesis, inhibition in steroidal hormones	Changamma and Lakshman (2013)
16.	<i>Celastrus paniculatus</i> Willd. Celastraceae Jyotishmati, seeds	Alkaloids, tannins, saponins, steroid, terpenoid, flavonoids, phlobatannin, cardiac, and glycoside	Seed	Antispermaticogenic activity	Bidwai et al. (1990)
17.	<i>Cichorium intybus</i> L. Asteraceae, Chicory Whole plant	Inulin, sesquiterpene lactones, vitamins, minerals, fat, and mannitol,	Aqueous	Antispermaticogenic activity	Roy and Venkatakrishna (1983)
18.	<i>Cinnamomum camphora</i> (L.) J.Presl Lauraceae Karpur Camphor, leaves and resin	Essential oil—camphor, linalool, and cineole	Leaf	Inhibition of spermatogenesis	Singh (1990b)
19.	<i>Cuminum cyminum</i> L. Apiaceae Jeerak, seeds	Cuminal and cuminic alcohol	Extract	Antispermaticogenic effect	Priya et al. (2012); Sharma J et al. (2001)
20.	<i>Embelia ribes</i> Burm.f. Primulaceae Vidang, berries	Embelin, volatile oil, and fixed oil	Isolated embelin	Inhibition of spermatozoa motility	Prakash (1981); Nand (1981); Dixit et al. (1983); Gupta et al. (1989)
21.	<i>Euphorbia nerifolia</i> L. Milk brush Euphorbiaceae Latex, Whole plant	β -amyrin acetate, lupenone, 3-acetoxy-20-lupanol, cycloart-25-en-3 β , 24 ζ -diol, and cycloart	Ethanol	Antispermaticogenic effect	Mali (1999)
22.	<i>Hibiscus rosa-sinensis</i> L. Malvaceae Japa Flowers	Cyclopeptide alkaloid	Ethanol, benzene extract	Spermatogenic elements of testis and epididymal sperm count., androgenic activity	Reddy et al. (1997); Gupta et al. (1985)
23.	<i>Momordica charantia</i> L. Cucurbitaceae Karwellaka Roots and leaves	Glycosides, saponins, alkaloids, fixed oils, triterpenes, proteins, and steroids	Aqueous	Antispermaticogenic, antisteroidogenic activity	Naseem et al. (1998)
24.	<i>Ocimum sanctum</i> L. Lamiaceae, Tulsi, leaves	Carvacrol, sesquiterpene, hydrocarbon, and caryophyllene	Benzene extract	Decreased sperm count, weight of testis, and sperm motility	Pandey and Madhuri (2010)

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Sr. No.	Botanical name, family, Sanskrit name, parts	Chemical composition	Extract	Mode of action in experimental studies	Reference
25.	<i>Piper betle</i> L. Piperaceae <i>Betel leaf, Pan</i> Petiole	Eugenol, eugenol acetate, piper betol, piperol, methyl eugenol, and phytol	Alcoholic extract	Reduced sperm motility	Adhikary et al. (1989); Sarkar et al. (2000)
26.	<i>Piper nigrum</i> L. Piperaceae <i>Marich, Black pepper</i> Fruit	Piperine	Fruit powder—suspended in sterile distilled water containing milk powder	Alterations in the male reproductive organs, reversible after cessation of treatment	Mishra and Singh (2009), Malini et al. (1999)
27.	<i>Plumbago zeylanica</i> L. Plumbaginaceae <i>Chitrak, Root</i>	Plumbagin	Ethanol	Antispermaticogenic	Purohit et al. (2008)
28.	<i>Pterocarpus santalinus</i> L.f. Fabaceae <i>Raktachandan</i> Stem bark	Santal A, B, savinin, calocedrin, pterolinus K, L, and pterostilbenes	Water	Semen coagulating activity	Dhawan et al. (1980)
29.	<i>Pueraria tuberosa</i> (Willd.) DC. Fabaceae, <i>Varahikand</i> , rhizome	Puerarin, genistein, and daidzein	Methanol	Inhibition of spermatogenesis	Gupta et al. (2004), Gupta et al. (2005b)
30.	<i>Semecarpus anacardium</i> L.f. Anacardiaceae <i>Bhallatak, Marking nut</i> , Seeds	Bhilwanols, phenolic compounds, biflavonoids, and sterols glycosides	Ethanolic	Reduction in the number of primary spermatocytes, secondary spermatocytes, and spermatids	Gupta et al. (2013); Sharma et al. (2003)
31.	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn. Combretaceae <i>Arjuna, Bark</i>	Tannins, triterpenoid saponins, flavonoids, gallic acid, ellagic acid, and phytosterols	Crude form	Inhibition of spermatogenesis	Jha and Dixit (1986), Lal and Udupa (1993)
32.	<i>Tylophora asthmatica</i> (L.f.) Wight & Arn. Apocynaceae <i>Khadki Rasna</i> Leaf and stem	Aempferol, quercentin, tyloindane, cetyl-alcohol, tannins, glucose, calcium salts, and potassium chloride	Pure alkaloid	Antispermaticogenic activity	Dikshith et al. (1990)
G Spermicidal activity					
1.	<i>Acacia concinna</i> (Willd.) DC. Leguminosae-Mimosoideae <i>Shikai</i> , stem bark	Hexacosanol, spinasterone, oxalic, tartaric, citric, succinic, ascorbic acid, alkaloids calyxtonine, and nicotine	Alcoholic	Spermicidal and semen coagulating activity	Kamboj and Dhawan (1982)
2.	<i>Achyranthes aspera</i> L. Amaranthaceae <i>Apamarga</i> Whole plant, Stem bark, Root	Fatty acids, oleonic acid, bisdesmosidic, triterpenoid alkaloids, D-glucuronic, betaine, and achyranthine	Benzene, ethanolic, and chloroform	Spermicidal	Raj et al. (2011); Shibeshi et al. (2006); Vasudeva and Sharma (2006)
3.	<i>Alstonia scholaris</i> (L.) R.Br. Apocynaceae <i>Saptaparna</i> , stem bark	Erythrodiol, uvaol, betulin, oleanolic acid ursolic acid, and β -amyrin	Water extract	Decline germ cell population	Gupta et al. (2003), 2004
4.	<i>Azadirachta indica</i> A. Juss. Meliaceae <i>Nimba</i> Leaves, flower, and seed	Azadirachtin, nimbinin, nimbin, nimbidin, nimbidol, sodium nimbinate, and gedunin	Aqueous and Alcoholic	Spermicidal effect on number of spermatozoa and level of fructose	Gediya et al. (2011), Kasturi et al. (1997)
5.	<i>Bambusa bambos</i> (L.) Voss Poaceae, <i>Vansha</i> Tender stem	Balarenone, barlerin, barlerinosideverbascoside, acetylbarlerin, and lupulinoside	Ethanolic	Reduced sperm motility	Vanithakumar et al. (1989)

(Continued on following page)

TABLE 2 | (Continued) Medicinal plants and their phytoconstituents validated for various female/male contraceptive activities. Different contraceptive activities studied on medicinal plants could be categorized as follows. Female contraceptive activities: (2A) anti-implantation activity, (2B) abortification, (2C) antifertility, (2D) antiovulatory, and (2E) antiestrogenic activity. Male contraceptive activities: (2F) antispermaticogenic, (2G) spermicidal, and (2H) antiandrogenic activity.

Sr. No.	Botanical name, family, Sanskrit name, parts	Chemical composition	Extract	Mode of action in experimental studies	Reference
6.	<i>Cannabis sativa</i> L. Cannabaceae <i>Bhang</i> , leaves	Cannabinoids, terpenes, and sesquiterpenes	Butin	Testicular lesions	Dixit and Joshi (1982)
7.	<i>Citrullus colocynthis</i> (L.) Schrad. Cucurbitaceae <i>Indrawaruni</i> <i>Bitter apple</i> , fruits	Carbohydrate, protein, amino acid, tannins, saponins, phenolics, and cardiolglycoloids	Ethanol	Impairment of sperm	Chaturvedi and Dixit (1997)
8.	<i>Daucus carota</i> L. Apiaceae <i>Grinjanak</i> , Seed	Essential oil	Petroleum, ether, benzene, alcohol, and water	Spermicidal activity	Garg (1975); Jansen and Wolhlmuth (2014); Shah and Varute (1980)
9.	<i>Embelia ribes</i> Burm.f. Primulaceae <i>Vidang</i> , Berries	Embelin	Embelin in 50 and 100 mg/kg doses	Reversible contraception like activity in male dogs	Nand (1981); Dixit and Bhagava (1983)
10.	<i>Mentha arevensis</i> L. Lamiaceae <i>Pudina</i> , leaves	Alkaloids, steroids, and glycosides	Petroleum ether	Spermicidal Decreased weight of testis, sperm motility, and viability	Sharma and Jacob (2001a)
11.	<i>Myristica fragrans</i> Houtt Myristicaceae <i>Nutmeg</i> , <i>Jatiphal</i> , seeds	Myristicin, elemicin, myristic acid, alpha-pinene, terpenes, beta-pinene, and trimyristin	Ethanol	Premature ejaculation	Mishra and Shukla (1980)
12.	<i>Strychnos potatorum</i> L.f. Loganiaceae <i>Nirmali</i> , Seeds	Strychnine	Seed extract	Suppressive effects on male fertility	Gupta et al. (2006)
13.	<i>Terminalia bellirica</i> (Gaertn.) Roxb. Combretaceae <i>Bibhitak</i> Fruits	Phenolic acids, saponins, lignans, triterpenoids, resveratrol glycosides, arjungenin, β -sitosterol, and stigmasterol	Aqueous	Spermicidal activity in rat semen, human semen	Kaur et al. (2011)
14.	<i>Tinospora cordifolia</i> (Willd.) Hook.f. & Thomson Menispermaceae <i>Amrita Giloe</i> Stem	Berberine, palmatine D, choline D, diterpene, terpenoids alkaloids, and steroids	Aqueous	Spermicidal Reduced weight of testis, sperm count	Gupta and Sharma (2003)
15.	<i>Trigonella foenum-graecum</i> L., Fabaceae <i>Methika</i> , Seeds	Water, carbohydrates, protein, fat, and calcium	Aqueous	Spermicidal activity in human and rat semen	Priya et al. (2012)
16.	<i>Withania somnifera</i> (L.) Dunal Solanaceae <i>Ashwagandha</i> Stem and root	Withanolides	Stem, ethanolic	Reversible spermicidal and infertilizing effect	Singh et al. (2013); Mali (1999)
H Antiandrogenic activity	<i>Aloe barbadensis</i> Mill. Synonym of <i>Aloe vera</i> (L.) Burm.f. Asphodelaceae <i>Kumari</i> , leaves	Water, polysaccharides, pectin, cellulose, hemicellulose, and glucomannan	Extract	Antiandrogenic activity on monkeys	Dixit et al. (1983)

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TABLE 2 | (Continued) Medicinal plants and their phytoconstituents validated for various female/male contraceptive activities. Different contraceptive activities studied on medicinal plants could be categorized as follows. Female contraceptive activities: (2A) anti-implantation activity, (2B) abortification, (2C) antifertility, (2D) antiovulatory, and (2E) antiestrogenic activity. Male contraceptive activities: (2F) antispermaticogenic, (2G) spermicidal, and (2H) antiandrogenic activity.

Sr. No.	Botanical name, family, Sanskrit name, parts	Chemical composition	Extract	Mode of action in experimental studies	Reference
2.	<i>Aristolochia indica</i> L. Aristolochiaceae <i>Ishwari</i> , roots	Aristolochic acid, ceryl alcohol, β -sitosterol, stigmast-4-en-3-one, friedelin, and cycloecalenol	Aristolochic acid	Antiandrogenic effects on langur monkey	Gupta et al. (1996)
3.	<i>Andrographis paniculata</i> (Burm.f.) Nees Acanthaceae <i>Kirattikta</i> , leaves	Andrographolide, andrographidoids A, B, C, D, E, diterpenoid, and lactone	Water extract	Antiandrogenic	Akbarsha et al. (1990); Akbarsha and Murugaian (2000)
4.	<i>Azadirachta indica</i> A. Juss., Meliaceae <i>Nimba</i> Leaves, flower, and seed	Azadirachtin, nimbozin, nimbin, nimbidin, nimbidol, sodium nimbinate, and gedunin	Seed oil	Antiandrogenic	Sharma et al. (1987); Sinha et al. (1984); Roop et al. (2005)
5.	<i>Cuscuta reflexa</i> Roxb Convolvulaceae <i>Amarwel</i> , whole plants	Alkaloids	Methanolic	Antisteroidogenic	Gupta et al. (2003)
6.	<i>Curcuma longa</i> L. Zingiberaceae <i>Haldi</i> , rhizome	Curcumin and flavonoids	Ethanol, aqueous	Antiandrogenic	Bhagat and Purohit (1986)
7.	<i>Foeniculum vulgare</i> Mill Apiaceae <i>Common fennel</i> , seeds	Anethole, alpha pinene, beta myrcene—pinene, bitter fenchone, camphene, and estragole	Alcoholic	Antiandrogenic	Farooq et al. (1997)
8.	<i>Hibiscus rosa-sinensis</i> L. Malvaceae <i>Japa, Flowers</i>	Cyclopeptide alkaloid	Ethanol and Benzene extract	Spermatogenic elements of testis and epididymal sperm count., androgenic activity	Reddy et al. (1997); Gupta et al. (1985)
9.	<i>Mucuna urens</i> (L.) Medik. Fabaceae <i>Horase been, Kapikacchu</i> Seeds	L-DOPA, with trace amounts of serotonin, nicotine, and bufotenine	Water	Effect on gonads and sex accessory glands	Udoh and Ekpenyong (2001)
10.	<i>Nicotiana tabacum</i> L. Solanaceae Tobacco, leaves	Lipid constituents, free fatty acids, triglycerides, and sterol esters free sterols	Nicotine	Antiandrogenic	Londonkar et al. (1998)
11.	<i>Plumbago zeylanica</i> L. Plumbaginaceae <i>Chitrak</i> , root	Plumbagin	Plumbagin-free alcohol	Antiandrogenic	Bhargava (1984)
12.	<i>Ruta graveolens</i> L. Rutaceae, Rue, leaves	Volatile oil	Aqueous extracts	Adverse effects on territorial aggression and sexual behavior in male albino rats	Khoury and Akawi (2005)
13.	<i>Semecarpus anacardium</i> L.f. Anacardiaceae <i>Bhallatak, Marking nut</i> , Seeds	Bhilwanols, phenolic compounds, biflavonoids, and sterols glycosides	Aqueous extracts	Antiandrogenic	Singh (1985)

a cost-effective herbal contraceptive for its spermicidal property and is considered safe for regular use. (Achintya, 2018).

Ricinus communis L.

The seeds of *Ricinus communis* Linn RICOM-1013-J, administered as a single oral dose of 2.3–2.5°g once/12°months acted as protection against pregnancy in 50 women volunteers. The study revealed very minimal side effects. The antifertility and contraceptive efficacy of RICOM-1013-J is due to hormonal mechanisms (Isichei et al., 2000). Goncim et al. (2010) stated that one seed of *Ricinus communis* L. taken orally can prevent ovulation in humans and the anticonceptive effect may be due in part to the prevention of ovulation.

Compound Formulation

A study was conducted on a combination of *Ashoka* (*Saraca indica* L.), *Vidanga* (*Embelia ribes Burm.f.*), *Laksha* (*lac*), and *Kramuk* (*Areca nut*) on 834 young, healthy patients in active reproductive age below 40°years. The drug was administered from the 5th°day of LMP for a period of 15°days in a daily dose schedule of 1°gm (2 tablets) at bedtime with milk. Results suggested that the failure rate of treatment 1.19/HWY is comparable to both steroidal oral contraceptive pills and intrauterine device. It does not affect the hypothalamo-pituitary axis and did not have any other adverse effects. It can be a good alternative for lactating women (Palep and Jukar, 2003).

Central Council for Research in Ayurveda and Siddha had taken up a number of studies to evaluate the efficacy of Ayurvedic formulations like *K Capsule*, *Ayush AC-IV*, *Pippalyadi yoga* (in three different doses), *Ayush AC II*, *Talisadi yoga*, *Vidangadi yoga*, etc., which were proved as safe and effective in different clinical studies. Besides this, the council also tried the efficacy of *neem oil*—as a local contraceptive and found encouraging results (Galib et al., 2008).

TERATOGENIC EFFECT

Ayurveda classical texts have references to congenital birth [*anmabalapravrita*] disorders as per the etiopathology and clinical presentation. Some congenital malformations in the fetus may occur but the mechanism is still not clear.

Teratogen is an agent or factor that causes malformation in the embryo. One of the causes of malformation may be toxic substances such as drugs and environmental toxins in pregnancy.

Herbal drugs with appropriate dose and duration may not cause teratogenic effect but in the case of excess dose with improper mode of administration, for a longer duration than therapeutically advised, teratogenic effect may be seen. Scientific validation of their safe use in pregnancy is hardly documented. Teratogenic effects of some of the medicinal plants have been mentioned in Table 3.

It is observed that drugs having contraceptive and abortifacient action have potent teratogenic effect in experimental models. There are several studies of teratogenicity on other herbal drugs which are not showing teratogenic effects in low doses and may cause

teratogenic effects in high doses, for example, *Ashwagandha* (*Withania somnifera* (L.) Dunal), *Punarnava* (*Boerhavia diffusa* L.), *Narangi* (*Citrus aurantium L.*), *Nimba* (*Azadirachta indica* A. Juss.), *Jatamansi* (*Nardostachys jatamansi* (D.Don) DC.), (*Bala Abutilon indicum* L.) Sweet), and *Yastimadhu* (*Glycyrrhiza glabra* L.) (Jati, 2018).

Different contraceptive activities in the abovementioned 94 plant ingredients are categorized in Table 4.

DISCUSSION

Presently, scientifically established methods of contraception and contraceptive drugs are used extensively. The synthetic contraceptive drugs known to interfere with the endocrine system and natural hormones may produce reproductive, neurological, developmental, and metabolic adverse effects that are serious at times. Search for safer drugs and preference for natural origin contraceptive drugs and methods are of research interests. Necessarily, the objectives for research of novel contraceptives from nature would be the assurance regarding effectiveness, safety, and user compliance. There are many plants known to have antifertility activity both in male and female. Some of these plants had spermicidal and altered hormone levels.

The classical Ayurvedic texts offer substantial knowledge on reproductive biology for healthy progeny and medieval Ayurvedic and specific Sanskrit texts provide information about methods and a broad range of therapeutics and ingredients that are described for use in contraception. These include local and oral contraceptives, abortifacients, and other methods of antifertility and birth control. These formulations and ingredients are a valuable source for extended research in the field of contraception.

In this study, 94 indigenous medicinal plants have been reviewed. Chemotaxonomically, it is of interest to note that the maximal number of plants having abortifacient and contraceptives are from *Fabaceae*, *Acanthaceae*, *Euphorbiaceae*, and *Liliaceae* families.

Ingredients, Phytoconstituents, and Contraceptive Activities

Certain alkaloids, glycosides, saponins, tannins, terpenoids, and other phytoconstituents are known to disrupt ovarian functions and estrous cyclicity through interplay of ovarian and extra ovarian hormones. Alkaloids are a major group of secondary metabolites bitter in taste that stimulate the central nervous system or directly work on the human brain. These are antiparasitic, antiplasmoidal, anticorrosive, antioxidative, antibacterial, anti-HIV, and have insecticidal activities. In a review, it has been suggested that maximum alkaloids containing plant drugs have been reported to have an antifertility, antiovulatory, anti-implantation, abortifacient effect on animals (Choudhury and Jadhav, 2013).

A majority of these medicinal ingredients used either in formulations or singly over centuries have also been studied for a variety of pharmacological, biological, and therapeutic activities.

Achyranthes aspera L.

A plant known to have antimicrobial, hypolipidemic, and has antifertility qualities is also used to treat asthma and cough.

Fruits of Annona squamosa L.

A known insecticidal, antiovulatory, and abortifacient plant that is hematinic, cooling, a sedative, stimulant, expectorant, and tonic. Its seeds are abortifacient and insecticidal and are used to destroy lice in the hair.

Calotropis gigantea L.

Calotropis gigantea L. having certain antifertility glycosides and cardenolides is used for colic pain, flatulence, asthma, cough, and whooping cough and has wound healing, anticancer, and hypoglycaemic effects. *Calotropis Madar* rootbark is used for

abortive purposes and in India is used as an antidote and in the treatment of elephantiasis, leprosy, and chronic eczema.

Camphor

Camphor, the well-known aromatic, has hormone-modulating, contraceptive, abortifacient, and lactation-inhibiting properties in women. It has a dose-dependent effect in human sperm motility and viability. Camphor can pass the placental barrier and affect embryo development. Camphor-containing compounds have shown uterotrophicantitussive, anticonvulsant, nicotinic receptor blocking, anti-implantation, antiestrogenic, as well as estrogenic activities and can reduce serum triglyceride and thyroid hormone.

Flowers of *Hibiscus rosa-sinensis* L containing quercetin-7-O-galactoside, polyphenolic compounds, and kaempferol, having antispermatic compounds, is prescribed for contraception

TABLE 3 | List of drugs with teratogenic effect

Sr. No.	Name of plants	Phytoconstituent	Dose and duration	Teratogenic effect
1	<i>Asparagus racemosus</i> Willd.	Shatavarin, Racemosol	1000°mg/kg/body weight for 60-day Charles foster rat pups	Prenatal study—increased resorption of fetus, gross malformation i.e., swelling in legs, IUGR with small placental size.
		Root	Methanolic extract	Postnatal study—decreased number of pups per litter and increased mortality of pups and delayed developmental parameters Goel et al. (2006)
2	<i>Datura metel</i> L. Leaves	Atropine alkaloids	500°mg/body kg wt rats, ethanolic extract	Teratogenic in the late stage of pregnancy Azeez and Philip (2013)
3	<i>Gloriosa superba</i> L. Tuber	Colchicine	1-3 ppm and 4-5 ppm Hydroalcoholic extract	Antifertility activity scarcely produced abnormal embryos. Induce high percentage of abnormalities. Badwaiq (2011)
4	<i>Lawsonia inermis</i> L.	Flavonoid and phenolic compounds	100°mg/kg body wt. BALB/c mice between 8-12°wk hydroalcoholic extract	90% embryo, more extra ribs anencephaly, exencephaly, skeletal abnormalities, height and weight loss in embryos Lobat (2015)
5	<i>Luffa operculata</i> (L.) Cogn. Tea, decoction	Glycosides, saponins, resin, free sterols, aliphatic esters, quinones	After ingestion of a variable amount of tea made with dried fruit, decoction	Abortion, reduction in birth rate Barilli et al. (2005)
6	<i>Plumbago zeylanica</i> L.	Plumbagin	100°mg/body kg wt orally with 0.5°ml of distilled water in mice	Stunted growth, subcutaneous, and deep hemorrhage, kinking of tail, protrusion of back of head Srivastava (2017)
7	<i>Ruta graveolens</i> L.	Essential oil	5, 10, and 20% w/v or plain water (control) orally for 4 days	Changes in the blastocyst formation, reducing the number, and delaying the development of embryos Gutiérrez-Pajares et al. (2003) embryotoxic effect De Freitas et al. (2005)
8	<i>Senna (Senna) alexandrina</i> Mill- Fabaceae	Sennosides	Extract	Increase blood flow to the uterus and its attachments, increasing the risk of fetal loss, and may pass spasms in the infant Schulz et al. (2002)
9	<i>Zingiber officinale</i> Roscoe	Carbohydrates (50–70%), lipids (3–8%), terpenes, and phenolic compounds	Orally at 0, 250, 500, 1000, or 2000 °mg/kgbw/day—five groups	High dose significantly reduced the number of live fetuses, increased fatal death, and resorption. Reda et al. (2018)
10	<i>Pipalyadi gutika</i>	Piperine	5 times to one and five times to the other than the recommended dose for humans Rats	Fetus—LBW, smaller in length, developmental defects of soft tissues, skeletons, herniation of intestines into umbilical cord, Mother—less weight gain during gestation Chaudhury et al. (2001)
11	<i>Vishamustivati</i> [MV] & <i>Shuddha Tankana</i> [ST]	-	175°mg/kg of aqueous solutions of VisamustiVati, 300°mg/kg aqueous solutions of SudhaTankana, orally from day 1 to day 7 of post mating period	VV and ST shows positive Teratological effect on new-borns, gross remarkable external morphological and skeletal defects Jati (2018)

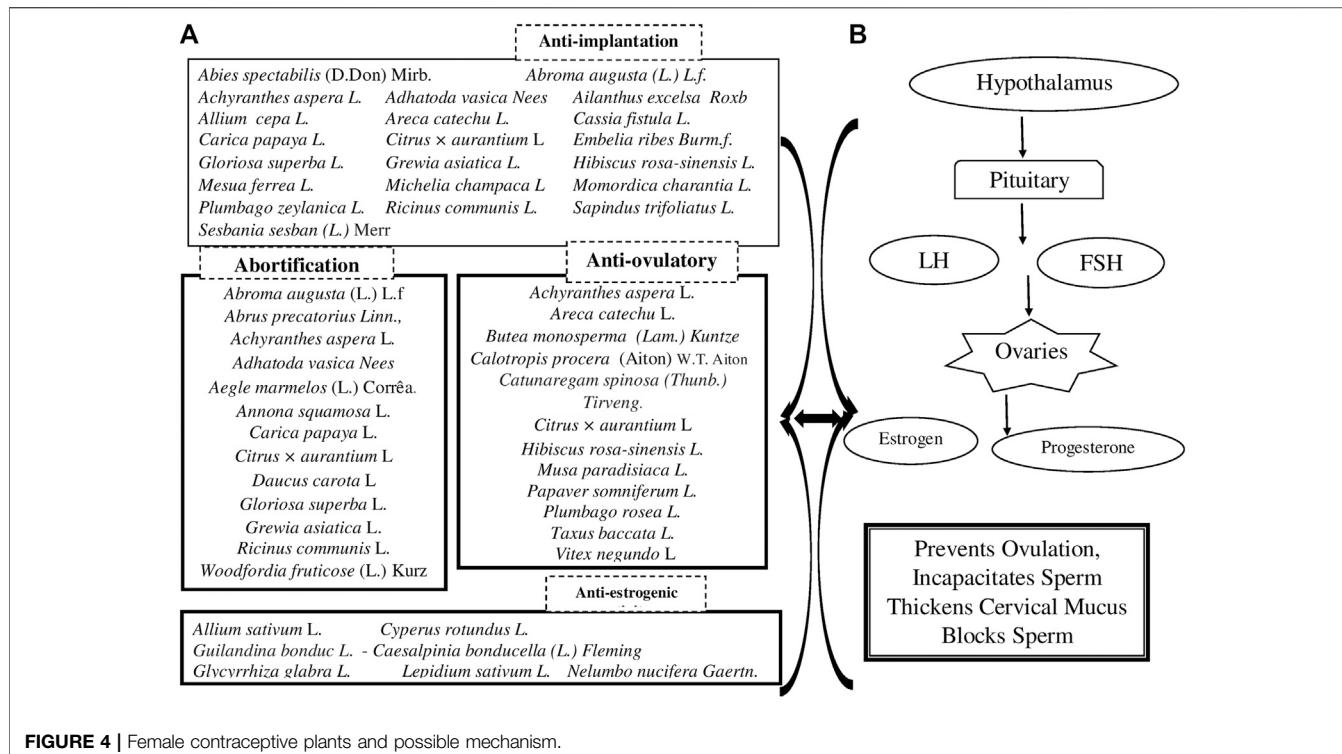
TABLE 4 | List of medicinal plants with one or more contraceptive activities.

Sr. No	Plant name	Anti-implantation	Abortification	Antifertility	Antiovulatory	Antiestrogenic activity	Antispermaticogenic	Spermicidal	Antiandrogenic activity
1	<i>Abies spectabilis</i> (D.Don) Mirb.	✓							
2	<i>Abroma augusta</i> (L.) L.f.	✓	✓						
3	<i>Abrus precatorius</i> L.		✓	✓			✓		
4	<i>Acacia concinna</i> (Willd.) DC.							✓	
5	<i>Acacia leucophloea</i> (Roxb.) Willd.			✓					
6	<i>Achyranthes aspera</i> L.		✓		✓				
7	<i>Adhatoda vasica</i> Nees	✓	✓						
8	<i>Aegle marmelos</i> (L.) Corrêa.		✓				✓		✓
9	<i>Ailanthus excelsa</i> Roxb	✓							
10	<i>Albizia lebbeck</i> (L.) Benth.						✓		
11	<i>Allium cepa</i> L.	✓							
12	<i>Allium sativum</i> L.					✓			
13	<i>Aloe barbadensis</i> Mill.	✓							✓
	Synonym of <i>Aloe vera</i> (L.) Burm.f.								
14	<i>Alstonia scholaris</i> (L.) R.Br.						✓		✓
15	<i>Andrographis paniculata</i> (Burm.f.) Nees						✓		✓
16	<i>Ananas comosus</i> (L.) Merr							✓	
17	<i>Annona squamosa</i> L.		✓				✓		
18	<i>Areca catechu</i> L.	✓	✓	✓	✓		✓		
19	<i>Aristolochia indica</i> L.						✓		
20	<i>Azadirachta indica</i> A. Juss.			✓	✓		✓		
21	<i>Bacopa monnieri</i> (L.) Wettst.						✓		
22	<i>Balanites roxburghii</i> Planch.						✓		
23	<i>Bambusa bambos</i> (L.) Voss							✓	
24	<i>Barleria prionitis</i> L.		✓						
25	<i>Berberis aristata</i> DC						✓		
26	<i>Butea monosperma</i> (Lam.) Kuntze				✓		✓		
27	<i>Calotropis procera</i> (Aiton) Dryand.				✓		✓		
28	<i>Cannabis sativa</i> L.							✓	
29	<i>Carica papaya</i> L.	✓	✓	✓			✓		
30	<i>Cassia fistula</i> L.	✓							
31	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.								
32	<i>Celastrus paniculatus</i> Willd.						✓		
33	<i>Centratherum anthelminticum</i> (L.) Gamble	✓							
34	<i>Cichorium intybus</i> L.						✓		
35	<i>Cinnamomum camphora</i> (L.) J. Presl						✓		
36	<i>Cissampelos pareira</i> L.			✓			✓		
37	<i>Citrullus colocynthis</i> (L.) Schrad.				✓			✓	
38	<i>Citrus × aurantium</i> L	✓	✓		✓				
39	<i>Crateva unvala</i> Buch. -Ham				✓				
40	<i>Cuminum cyminum</i> L.				✓				
41	<i>Cuscuta reflexa</i> Roxb						✓		
42	<i>Curcuma longa</i> L.				✓				
43	<i>Cyperus rotundus</i> L.						✓		
44	<i>Daucus carota</i> L		✓	✓				✓	
45	<i>Desmodium gangeticum</i> (L.) DC.			✓	✓				
46	<i>Embelia ribes</i> Burm.f.	✓	✓					✓	
47	<i>Euphorbia nerifolia</i> L.						✓		

(Continued on following page)

TABLE 4 | (Continued) List of medicinal plants with one or more contraceptive activities.

Sr. No	Plant name	Anti-implantation	Abortification	Antifertility	Antiovulatory	Antiestrogenic activity	Antispermaticogenic	Spermicidal	Antiandrogenic activity
48	<i>Ferula jaeschkeana</i> Vatke			✓					
49	<i>Foeniculum vulgare</i> Mill							✓	
50	<i>Gloriosa superba</i> L.	✓	✓	✓					
51	<i>Glycyrrhiza glabra</i> L					✓			
52	<i>Grewia asiatica</i> L	✓	✓						
53	<i>Guilandina bonduc</i> L.					✓			
	<i>Sy. Caesalpinia bonducuella</i> (L.) Fleming								
54	<i>Hibiscus rosa-sinensis</i> L.	✓		✓	✓		✓		✓
55	<i>Lawsonia inermis</i> L.			✓					
56	<i>Lepidium sativum</i> L		✓	✓					
57	<i>Melia azedarach</i> L			✓					
58	<i>Mentha arevensis</i> L							✓	
59	<i>Mesua ferrea</i> L.	✓							
60	<i>Michelia champaca</i> L.	✓							
61	<i>Momordica charantia</i> L.	✓		✓			✓		
62	<i>Mucuna urens</i> (L.) Medik								✓
63	<i>Musa paradisiaca</i> L.				✓				
64	<i>Myristica fragrans</i> Houtt							✓	
65	<i>Nelumbo nucifera</i> Gaertn.					✓			
66	<i>Nicotiana tabacum</i> L.								✓
67	<i>Nigella sativa</i> L.			✓					
68	<i>Ocimum sanctum</i> L.						✓		
69	<i>Papaver somniferum</i> L.				✓				
70	<i>Piper betle</i> L.			✓					
71	<i>Piper longum</i> L.			✓					
72	<i>Piper nigrum</i> L.			✓					
73	<i>Plumbago rosea</i> L.				✓				
74	<i>Plumbago zeylanica</i> L.	✓							✓
75	<i>Pterocarpus santalinus</i> L.f.								
76	<i>Pueraria tuberosa</i> (Willd.) DC								
77	<i>Ricinus communis</i> L.	✓	✓						
78	<i>Ruta graveolens</i> L								✓
79	<i>Sapindus trifoliatus</i> L.	✓							
80	<i>Semecarpus anacardium</i> L.f.				✓		✓		
81	<i>Sesbania sesban</i> (L.) Merr	✓							
82	<i>Sesamum indicum</i> L								✓
83	<i>Strychnospotatorum</i> L.f.					✓			
84	<i>Taxus baccata</i> L				✓			✓	
85	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn								
86	<i>Terminalia bellirica</i> (Gaertn.) Roxb							✓	
87	<i>Tinospora cordifolia</i> (Willd.) Hook.f.& Thomson							✓	
88	<i>Trichosanthes cucumerina</i> L.			✓					
89	<i>Trigonella foenum-graecum</i> L.							✓	
90	<i>Tylophora asthmatica</i> (L. f.) Wight & Arn						✓		
91	<i>Vitex negundo</i> L.				✓				
92	<i>Withania somnifera</i> (L.) Dunal					✓			
93	<i>Woodfordia fruticosa</i> (L.) Kurz								✓
94	<i>Zingiber officinale</i> Roscoe		✓		✓				

**FIGURE 4 |** Female contraceptive plants and possible mechanism.

and is used to treat bacterial infection, hyperlipidemia, and depression and act as an antioxidant.

Two of the most bitter stimulant plants, *Momordica charantia* L. and *Azadirachta indica* A. Juss., produce an irregular pattern of estrous cycle with prolonged diestrus phase. Steroids, triterpenoids, reducing sugars, alkaloids, phenolic compounds, flavonoids, and tannins in the plant cause reduction in the number of normal follicles because of atresia which occur due to disruption of the process of follicle selection. *Azadirachta* arrests spermatogenesis and androgen depletion.

Roots of *Plumbago zeylanicum* L. have been used as an abortifacient, internally or as an irritant to the uterus. This acrid and stimulant root increases appetite helps indigestion and is used for dyspepsia, piles, and skin diseases. It induces sweating, its powder is occasionally taken as snuff to relieve headache, and it helps in the adhesion of tissues in the body and is antidiarrheal.

Tinospora cordifolia (Willd.) Hook.f. and Thomson, an immunomodulator plant used to treat tuberculosis, fever, and wounds, has antifertility qualities. It is used for antioxidant, hypoglycaemic, and cardioprotective activities.

Excessive use of substances having pungent, bitter, and astringent tastes is contraindicated for sexual functions. Excess consumption of bitter taste leads to loss of strength and energy, astringent taste affects the sperm count, and can even reduce the sex drive while strongly pungent ingredients like pepper exhibit spermicidal or abortifacients effects.

Prolonged consumption of these tastes may lead to emaciation of the body.

Mechanism of Action

Female Contraceptives

Medicinal plants may induce infertility in distinct ways. They may affect the ovarian, uterine, and hormone production functions and interfere with implantation or sperm production. These drugs are of natural origin, hydrophilic, and lipophilic; can traverse paracellularly through the vaginal mucosa; and exhibit its efficacy as contraceptive, by altering the vaginal pH. These drugs may variably act locally to bring changes in the cervical mucus and alter decidual embedding and thereby act as anti-implantation agents, or may inhibit propulsion of sperm in the fallopian tubes by altering tubal mechanism or may act on hormones as antiovulation agents. They may act through rapid expulsion of the fertilized ova from the fallopian tube or inhibit implantation due to disturbance of the estrogen progesterone balance or induce fetal abortion by inhibition of nutrition to the uterus and the embryo.

Moreover, plants with estrogenic property can directly influence pituitary action by peripheral modulation of luteinizing hormone (LH) and follicle stimulating hormone (FSH), decreasing their secretions and blocking ovulation (Brinker, 1997). Plants with antiestrogenic activities intercept in the process of development of ovum and endometrium and on the other hand, plants have abortifacient effects (Gark et al., 1978; Prakash et al., 1985).

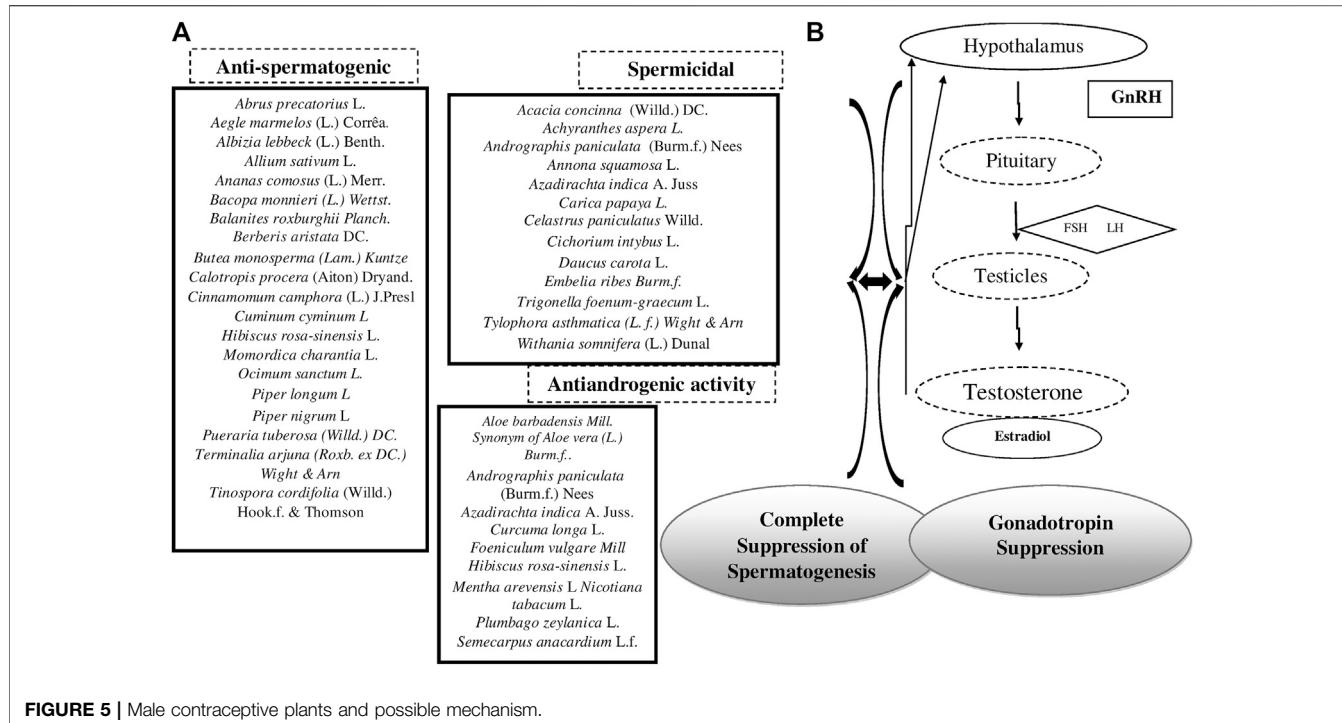


FIGURE 5 | Male contraceptive plants and possible mechanism.

The site of action of antifertility agents in females comprises the hypothalamus, the anterior pituitary, the ovary, the oviduct, the uterus, and the vagina. The mammalian uterus is the main site of antifertility effects (Williamson et al., 1996). Typical estrogenic compounds possess the ability to increase the uterine wet weight and induce cornification and opening of vagina in immature rats, which results in anti-implantation effects (Turner, 1971).

Antifertility plants prevent fertilization; these drugs obstruct the formation of gametes and interfere with the process of fertilization. Antiovulatory plants induce infertility by suppressing ovulation. *Anti-implantation* plants prevent the attachment or penetration of fertilized ovum into the uterus. *Butea monosperma* (Lam.) Kuntze, *Ocimum sanctum* L., *Calotropis procera* (Aiton) W.T. Aiton, *Mentha arvensis*, and *Lawsonia inermis* L—all have anti-implantation activity. Abortifacient plants cause early expulsion of the fetus. These act during the first five weeks of pregnancy as they block the action of progesterone so that the uterus sloughs off the embryo. *Abrus precatorius* L., *Annona squamosa* L., *Calotropis procera* (Aiton) W.T. Aiton, *Carica papaya* L., *Datura metel* L., *Momordica charantia* L., and *Catunaregam spinosa* (Thunb.) Tirveng are medicinal plant drugs which can be used as abortifacients. Stimulant, irritant, and bulk forming characteristics of these drugs facilitate abortion along with hormonal regulation and modulation of genital functioning. These ingredients are considered stimulants and are hot in nature and hence should be used for a short duration.

It is observed that large numbers of antifertility plant extracts are known to exhibit estrogenic activity in rats (Dahanukar et al., 2000). Estrogenic substance may cause the expulsion of ova from the tube, disruption of luteotrophic activity of the blastocyst, and disrupt the functional equilibrium between the endogenous

estrogen and progesterone, which may result in failure in fertility. Increase in the wet weight of uterus of substance-treated ovariectomized immature rats may indicate that the substance has an estrogenic effect (Mukherjee, 2002).

The hypothalamus has threshold requirement for estrogen to cause a massive release of LH by the pituitary gland. This surge of LH is the trigger, which initiates the rupture of the follicle (ovulation) (Bullock et al., 1995). It is known that an increase in the serum progesterone level prevents pregnancy through inhibition of ovulation and alteration of cervical mucus.

Most of the plants possess inhibition of implantation or reduction of estrogen level and increment of progesterone level as the possible mechanism of antifertility effect.

The anti-implantation effect may be due to the disturbance of endocrine-endometrial synchrony that is dependent on estrogen and progesterone balance. Factors other than the hormones such as histamine, prostaglandins, proteolytic enzyme NOS, alkaline phosphatase, interleukins, and leukemia-inhibitory factors, which are important for implantation, may also be affected by the various plant extracts (Gupta, 1994; Garg et al., 1978; Novaro et al., 1997; Prakash et al., 1989; Dimitriadis et al., 2003; Yang et al., 1994).

Male Contraceptives

Male contraceptive drugs may inhibit spermatogenesis or act on male hormones when used orally or may be spermatic or spermicidal when used intravaginally. Male contraceptives might work to suppress sperm production by antispermatogetic or prevent maturation of sperm or prevent the flow of sperm through the vas deferens or deposition of the sperm (Soni et al., 2015).

Plant extracts have also shown promising antifertility effects when administered to male rats. The various effects on male reproductive system to induce antifertility action shown by plants includes antispermatic effect, post-testicular antifertility effect, spermicidal effect, sperm-immobilizing effect, antiandrogenic effect, etc.

Antispermatic activity indicates interference in the steroidogenesis when the cholesterol level rises and squalene lipid accumulates (Mandal et al., 2010). Some of the plant extracts kill the viability and work on Sertoli cells and have various effects on spermatogenesis, such as reducing the nuclear and cytoplasmic volume and vacuolizing Sertoli cells (Sharma RS et al., 2001) or acts through Leydig cells (Dufau et al., 1984). Some plant extracts act by unbalancing the hormones or through their antimotility activity (Verma and Yadav, 2021).

Spermicides are contraceptive substances that destroy the sperm when inserted vaginally prior to intercourse. The spermicidal agents consist of a surfactant that destroys the sperm cell membrane. Lipid peroxidation may play an important role in disrupting the sperm membrane physiology that may or may not be accompanied with a detrimental effect on the defense system of the human spermatozoa against the ROS.

Antiandrogens, also known as androgen antagonists or testosterone blockers, prevent androgens like testosterone and dihydrotestosterone (DHT) from mediating their biological effects in the body. *Andrographis paniculata* (Burm.f.) Nees, *Azadirachta indica* A. Juss., *Curcuma longa* L., *Hibiscus rosa-sinensis* L., and *Plumbago zeylanica* L. act by blocking the androgen receptor (AR) and/or inhibiting or suppressing androgen production. They can be considered as the functional opposites of AR agonists, for instance, androgens and anabolic steroids (AAS) like testosterone, DHT, and nandrolone and selective androgen receptor modulators (SARMs) like enobosarm.

Figures 4, 5 provide group of these plants 3 (a) and 4 (a) with probable female and male contraceptive activities 3 (b) and 4 (b), respectively.

Limitations/Challenges

A major limitation is the contradictory reports or non-reproducibility of published data, which can provide useful leads. At times, failure of reproducibility of contraceptive activity of a plant or its constituent is observed. This could be due to the multiple factors at different levels that are known to affect the reproductive process. The other reason could be the variable effect of the herbal contraceptive/s in animals as against when used in humans.

The contraceptives of natural origin are not used much in practice, the main factor being the lack of standardization and reliable validation studies. The information has thus remained fragmented. Studies have consequently been scarce. Interest has waned due to the complexity and enormity of the large and long-term study requirements covering multiple variables.

Analytical methods, information on phytoconstituents, availability of markers, and their activities have now provided

new standardization approaches to herbal products that assure higher safety and stability.

The solution to this is to investigate the efficacy of these herbs in humans themselves, after ascertaining their safety in animal models. There is also a need to record the conditions under which the plants are used by indigenous people, including the time and place of collection, proper botanical authentication, and schedule of administration. Advances in biology offer adaptable and promising experimental models to examine the effectiveness of natural products for altering reproductive functions and contraception

CONTRACEPTION AND NEW TECHNOLOGIES FOR NATURAL PRODUCTS

There is a need to use new contraceptive methods to minimize the side effects. The following technological advances are relevant in the context of this review for discovery and development of novel contraceptives of natural origin.

- o Ayurveda recommends fumigation as a method and as a therapeutic procedure to treat various diseases, including microbial infections. Ayurvedic methods of sterilization with fumigation can be alternated as a modern contraceptive with the help of nanotechnology. Natural novel bioactive compound drugs could be developed with novel drug-delivery systems.

- o A team in the University of Washington has developed an electrically spun cloth with nanometer-sized fibers that get dissolved to release drugs, thus providing a platform for cheap, discrete, and reversible protection ("Drug-Eluting Fibers for HIV-1 Inhibition and Contraception").

- o Pharmacy on a chip is one of the most exciting parts of the drug-delivery system. It is a chip implanted into the body which releases drugs at set intervals. It would release the hormones estrogen and progestogen over a specific period to stop the release of eggs from the ovaries and thus prevent pregnancy.

- o Nanotechnology-based condom systems have the potential to prevent the spread of HIV and STIs.

- o Transdermal drug delivery (TDD) is an alternative method of drug administration for drugs whose delivery by conventional oral, topical, intravenous, and intramuscular methods is of limited efficacy. Recent advances in TDD involve the use of nanoparticles (NPs), which exhibit great potential to enhance drug permeation across the skin.

- o Skin patches containing microneedles is a painless and minimally invasive method of TDD in which micron-sized pores are created in the epidermis to allow delivery of drugs to the blood vessels present in the dermal layer of the skin.

- o Researchers report on a technique for administering contraceptive hormones through special backings on jewelry such as earrings, wristwatches, rings, or necklaces. The contraceptive hormones are contained in patches applied to portions of the jewelry in contact with the skin, allowing the drugs to be absorbed into the body (Georgia Institute of Technology, 2019).

Possibilities for new means of drug development

- Developing newer biotechnology-based cellular or molecular models that could better replicate reproductive processes.
- Methods that act after ovulation and interfere with sperm delivery or function in the male or in the female genital tract or both ought to be adopted.
- Design of nonhormonal contraceptive agents—as an alternative option to hormonal formulations—with the help of herbals.
- New delivery mechanisms that can act both short and long term; the possibilities are to develop herbal pessary, jelly, patches, and condoms, or mechanical devices with natural ingredients to optimize the effects.
- Methods which limit the side effects associated with systemic exposure should be developed in lower dosage forms to ensure efficacy.
- Technologies that markedly improve the cost, acceptability, and deliverability of contraceptives.
- Personalized contraception-human genome could minimize the side effects while maximizing health benefits at the individual level.

CONCLUSION

Fertility and contraception are continued subjects of biomedical research and innovation. Alternatives to unmet needs for safer contraception methods and drugs are searched for. Many Ayurvedic medicinal ingredients and compound formulations are claimed to inhibit male and female fertility as mentioned in the classical literature. Several of these validated drugs possess

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- spermicidal, antispermatic, antiovulatory, anti-implantation, antiestrogenic, and abortifacient activity. The Indian system of medicine, Ayurveda, offers highly promising opportunities when analytical, biological, technological, and clinical advances are collectively integrated with therapeutic rationale based on Ayurvedic principles. A plethora of available data, information, and knowledge on these ingredients could be the subject of newer research interests.
- These medicinal ingredients need further reexamination and critical evaluation to explore their lesser known or unknown pharmacological and biological activity/activities and effects. Present-day biotechnological methods could be usefully utilized to evaluate their contraceptive efficacies. There is a need to revive and stimulate new research programs and projects that will not only benefit the need of contraception but will also throw new light on reproductive biology.

AUTHOR CONTRIBUTIONS

The corresponding author Dr. NB contributed to the concept, initial compilation, structure of the review, and final editing of the text and figures. Co-author Dr. MD contributed to compiling and comparing pharmacological data and the preparation of tables and figures.

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STRESS MANAGEMENT THROUGH AYURVEDA

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ABSTRACT

The main objective of *Ayurveda* is to maintain the health of a healthy person and to treat the diseased one. Healthy balance of the mind and body is given utmost importance in *Ayurveda*. This balance is hampered today by the change in life style of man, which is causing a lot of stress. Concepts of *Ayurveda*, meditation, *yoga*, physical exercises and a balanced diet may play an important role in relieving stress effectively. It is like rejuvenation and cleanup process on all levels, physical, mental and emotional. *Ayurveda* is highlighted as a holistic system with its concern for prevention and promotion of stress and mental health.

Keywords: Stress, effects of stress, Psychology in *Ayurveda*, Health in *Ayurveda*

INTRODUCTION

Ayurveda, the science of life, is the oldest system of medicine which has its mentioning in one of the oldest (about 6,000 years) philosophical texts of the world, the *Rig Veda*. The *Sutrasthana* of *Charaka Samhita*, a much referred *Ayurveda* text, says; "The three—body, mind and soul—are like a tripod, the world stand by their combination; in them everything abides. It is the subject matter of *Ayurveda* for which the teachings of *Ayurveda* have been revealed. (*Charaka Samhita*, 1.46-47). Life is the combination of body, senses, mind and reincarnating soul. *Ayurveda* is the most sacred science of life, beneficial to humans both in this world and the world beyond. (*Charaka Samhita*, Sutrasthana, 1.42-43).

Brahma the Creator, a part of the holy trinity of gods, first professed it and educated it to his son, *Daksha Prajapati*. Subsequently, Lord *Dhanwantari*, the god of healing and the teacher of the medical sciences passed it on to the prominent sages

Atreya, Bharadvaja, Kashyapa, Sushrut, Parashara, and Charaka. *Charaka Samhita* text is considered an authoritative pronouncement of *Ayurvedic* doctrine. Its present form goes back to the seventh century BC.

The study of mind is called as Psychology. The profounder of *Ayurveda* were probably the first who gave detailed description of mind and body relationship. They clearly stated that, the concept of mind and body are two separate entities. The word *Manas* is came out from the *Dhatus* and it forms the meaning of this is through which we are collecting the knowledge and objects that is called as *Manas*. (Shri Kanta Murthy).

Stress

Stress is basic elements of various human diseases and mental illness. Stress is a term that refers to the sum of the physical, mental, and emotional strains or tensions on a person. Stress is the “wear and tear” our mind and body experiences as we attempt to

cope with our continually changing environment. Stress is also called as anxiety, tension etc. Psychosocial stressor is defined as "any life event or life change that may be associated temporally (and perhaps causally) with the onset, occurrence, or exacerbation [worsening] of a mental disorder (Joshua Cowa et al.).

Feelings of stress in humans result from interactions between persons and their environment that are perceived as straining or exceeding their adaptive capacities and threatening their well-being. The element of perception indicates that human stress responses reflect differences in personality as well as differences in physical strength or health.

Stressor

A stressor is defined as a stimulus or event that provokes a stress response in an organism. Stressors can be categorized as acute or chronic, and as external or internal to the organism (Prakash Bet al).

Causes of Stress

One significant source of stress in modern life is the cumulative effect of various toxic waste products in the environment. Our personality, behavior, and lifestyle all have important influences on our stress level. Much stress occurs through emotions such as aggression, impatience, anger, anxiety, and fear, all of which kindle the body's stress responses. Eating an unhealthy diet, smoking, drinking, and taking drugs can also contribute further to physical strain. Stress may be generated through work, at home, within relationships, as a result of internal emotional conflict, through environment, diet, ill-health, and financial insecurity as well as through major life events such as marriage death, divorce etc.

Man facing number problems in the modern society, these problems thrown the man in to mental stress. Mental stress causes the number of psychosomatic disorder like hypertension, migraine and severe headache etc.

How does stress affect you?

The initial stage of arousal remains the same whether we are faced with a major or minor. But under extreme, prolonged, or persistent pressure the body continues to manufacture extra quantities of stress chemicals, triggering further processes to maintain energy. If arousal continues, the adrenal glands manufacture anti-inflammatory chemicals that simultaneously speed tissue repair while depressing the body's immune defense system (Dr. David Frawley) and (Sundaram K) if all these changes continue, the body goes on trying to adapt under increasing strain and pressure. Eventually it breaks down. Exhaustion, variety of illnesses and even death may be the outcome of uninterrupted, excessive stress.

Stress & Mental Illness

Primary psychological conditions caused purely by mental disorders are *kama* (lust), *krodha* (anger), *lobh* (greed), *moha* (delusion), *irshya* (jealousy), *mana* (pride), *mada* (euphoria), *shoka* (sorrow, grief), *chinta* (anxiety), *udvega* (neurosis), *bhaya* (fear), *harsha* (happiness). The psychiatric conditions caused by a combination of physical and mental (psycho-physical) disorders are *unmada* (psychosis), *apasmara* (convulsive disorder), *apatantraka* (hysteria), *atattvabhinvesha* (obsession), *bhrama* (illusion, vertigo), *tandra* (drowsiness), *klama* (neurasthenia), *mada-murchha-sanyasa* (loss of sensory perception leading to coma), *madatyaya* (alcoholism), *gadodvega*

(hypochondriasis) (M.G. Ramu and B.S. Venkataram).

Ayurvedic Psychology Charaka in his treatise *Charaka Samhita*, describes eight essential psychological factors that are negatively affected in various ways in all psychiatric disorders. The psychopathological condition is a function of these factors, which are *manas* (mind), *buddhi*, *smriti* (memory), *sajna jnana* (orientation and responsiveness), *bhakti* (devotion), *shila* (habits), *cheshta* (psychomotor activity) and *achara* (conduct). Compared to other major Ayurvedic texts like *Sushruta Samhita* and *Ashtanga Hrdayam*, *Charaka Samhita* gives more emphasis to the view of life as a self-aware field of pure consciousness and natural intelligence where the knower and the known are one. *Ayurveda* is very effective for stress management and to encourage body and soul to achieve composure of the mind (Ramesh U and Kurian Joseph).

Signs of Mental Health as per Ayurveda

Good memory, taking the right food at the right time, awareness of one's responsibilities, awareness of the self and beyond self, maintaining cleanliness and hygiene, doing things with enthusiasm, cleverness and discrimination, being brave, perseverance, maintaining cheerfulness irrespective of the situation, fearlessness in facing situations, sharp intellectual functioning, self-sufficiency, following a good value system and ability to proceed steadfastly against all odds.

Ayurvedic Treatment Methods

The *panchakarma* measures (L. V. Vithalani et. al.) used are:

1. *Vamana*: induced therapeutic vomiting.

2. *Virechana*: purgation through therapeutic laxative, providing symptomatic relief of mental illness.

3. *Vasti*: enema therapy. *Niruha Vasti* cleanses toxins from the *dhatus* and removes naturally accumulated body wastes from the colon. *Anuvasana Vasti* is to be retained in the body for a longer period for effectiveness.

4. *Nasya*: Nasal medication acts as a purificatory aid to the head where major sensory faculties are located. The clarity of these faculties (*indriya prasada*) leads to clarity of mind.

5. *Shirodhara*: medicated water, herbal oils and medicated milk are poured on the forehead through a special method for 30 to 45 minutes. It reduces anxiety, depression and mental stress and rejuvenates the central nervous system.

6. *Shiro Vasti*: keeping herbal oil in a cap fitted on head.

7. *Panchakarma* therapy is followed by *shaman* or purification treatment with oral medicines including herbal powders.

Ayurveda Medicines for Stress

Ayurveda classifies herbs with a stabilizing effect on the mind as '*medhya rasayanas*'. These herbs promote the intellect and deeply nourish the neurological tissues (N.Srikanth et al.). They are nervine tonics. These medicines act as specific molecular nutrients for the brain, promoting better mental health that leads to the alleviation of behavioral disorders (I.P.V Sharma). The *medhya rasayanas* enhance biological nourishment of the brain, producing tranquility of mind, concentration and improved memory. *Ashwagandha*, *Brahmi* and *Shankha pushpi* have a secondary mild sedative ef-

fect. Others like calamus have a mild stimulating effect. (Jyoti Shankar Tripathi).

Stress is relaxation with compound herbal formulation consisting of *Tagar* (*Valeriana wallichii*), *Shankhapushpi* (*Convolvulus pluricaulis*), *Brahmi* (*Bacopa monnieri*), *Musta* (*Cyperus rotundus*), *Ashwagandha* (*Withania somnifera*), *Jatamansi* (*Nardostachys jatamansi*), *Munakka* (*Vitis vinifera*), *Raktachandana* (*Pterocarpus santalinus*), *Parpataka* (*Fumaria indica*), *Kutaki* (*Picrorhiza Kurroa*), *Dashmula*, *Amaltas* (*Cassia fistula*). This has been given in the dose of 20g twice a day as coarse powder to prepare decoction by 'Chaturthavashesh' method mentioned by *Sharangadhara* (Vansh Bina and Chandola H. M.).

Anti-stress effect against stress related changes in immunoglobulin in the body due to the battery of stresses encountered at Antarctica (Bansal P et al.), *Rasayana* therapy has an advantage over the conventional *Kayachikitsa* treatment in such conditions, as it is capable of counteracting the stress, promote the adaptogenic abilities of the body, and enhance mental endurance. (K. Indrajith et al), (Yogesh Shamrao et al).

CONCLUSION

Ayurveda can play an important role to control stress. *Ayurveda* provides a combination of benefits such as *Pancha karma* and *Medya Rasayanas* (Medicines). *Dinacharya* and Physical Exercises can have great benefits in Stress and Health. So in conclusion, yes, *Ayurveda* can be a great remedy for stress and can offer some stress relief.

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Protocol for Prevention and Control *of* Diabetes through Ayurveda

**Ministry of Ayurveda, Yoga & Naturopathy, Unani,
Siddha and Homoeopathy
(AYUSH)**

Govt. of India

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सत्यमेव जयते

**Protocol for
‘Prevention and Control
of
Diabetes through Ayurveda’**

Released on First National Ayurveda Day, 28th Oct. 2016

by

**Ministry of AYUSH
Government of India**

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MESSAGE

India is a land of rich cultural heritage and has contributed immensely in the fields of science, arts and medicine. Ayurveda is boon to humanity and has gained much recognition in recent years. One of the main reasons for its increased significance is its unparalleled contribution in the management of metabolic disorders.



Incidence of diabetes is on rise in India to such an extent that it has gained the status of an epidemic. Diabetes is posing an enormous health problem to our country today. Certainly, modern medicines are available to keep a check on its growth; however its access in an ecological diverse country like India is less. Inactivity and improper diet are the main risk factors for onset of Diabetes.

Government realizes the challenge it is facing in creating awareness and devising plans to keep this disorder in check. Ayurveda through its lifestyle modulation and dietary guidelines can contribute immensely to this situation. These principles have been followed by every Indian since centuries, however with the advent of modern lifestyle, it had become obsolete.

Need of hour is to turn back to our roots and to imbibe the age old and time tested principles of Ayurveda and incorporate it in our day to day life to live a long and healthy life.

Ministry of AYUSH has recognized this potential of Ayurveda, and in an attempt to bring it in lime light, theme of Diabetes prevention and control of Ayurveda has been chosen on the occasion of First National Ayurveda Day. Herein, Mission Madhumeha is also been conceived to plan various activities throughout the year to promote the role of Ayurveda for management of Diabetes.

A protocol has also been prepared by Ministry of AYUSH that will strengthen the objective of this year's theme of National Ayurveda Day.

I congratulate my officers for putting this up together for the benefit of science in particular and mankind in general.

Jai Hind

Shri Shripad Yesso Naik

(Hon'ble AYUSH Minister)



अजीत मोहन शरण
AJIT M. SHARAN



सचिव

भारत सरकार

आयुर्वेद, योग व प्राकृतिक चिकित्सा
यूनानी, सिद्ध एवं होम्योपैथी (आयुष) मंत्रालय
आयुष भवन, 'बी' ब्लाक, जी.पी.ओ. कॉम्प्लेक्स,
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Message

Diabetes is a disease of complex pathology involving almost all organs in the body. It is affecting large segments of Indian population today. Diabetes is a chronic medical condition, which although cannot be cured, but is well preventable and manageable.

2. Ayurveda has a great potential in preventing this dreadful condition as well as offer better prospects for its management. Ayurveda, endowed with principles of healing through Nature offer a vast repertoire of guidelines for healthy lifestyle through well documented codes of conduct. These regulations are relevant even today.

3. Considering the complex pathology and the role of unhealthy life style in the pathogenesis, lots of efforts are required for prevention, awareness generation, screening and monitoring of diabetes in India.

4. Therefore, Ministry of AYUSH has come up with "Mission Diabetes through Ayurveda" on the occasion of First National Ayurveda Day. The protocol developed will be useful for the field staff in implementing the program.

5. It gives me immense pleasure to be a part of this great endeavor, and our team has done a commendable job in putting up this protocol which can prove to be very useful for all the practitioners and other staff working in the clinics and hospitals for controlling the spread of diabetes.

(Ajit M. Sharan)

NEW DELHI
27th October, 2016



सत्यमेव जयते

अनुराग श्रीवास्तव
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MESSAGE

In opinion of experts of World Health Organization, "the global burden and threat of non-infection diseases are the greatest threat to public health and undermine social and economic development in the whole of the world".

Preventive aspects of a disease are always undermined because due to lack of awareness, the disease already assumes enormous state.

Budgetary funds allocated for highlighting the significance of prevention is much smaller in comparison to those for its management.

However transition from management aspects to prophylactic, preventive aspects of disease and promotion of health requires meticulous efforts at grass root levels.

Ayurveda can certainly help because it is still vastly practiced amongst rural population of India which accounts for more than 65 % staying in villages.

Practicing and promoting principles of Ayurveda will not only decrease the incidence of diabetes but also help in reducing the mortality and morbidity related therein. Ayurveda also offers better options at the level of identifying prone individuals/populations, simple lifestyle and dietary modulations and effective management in controlling the epidemic of Diabetes.

Ayurveda centered policies can not only help in achieving the highest health standards for people but also improving health economy and ensuring social-economic development.

Ministry of AYUSH is celebrating first National Ayurveda Day themed on prevention and control of diabetes by launching Mission Madhumeha.

A protocol on Diabetes has also been prepared by my team incorporating the inherent principles of Ayurveda. This protocol would be helpful for implanting the "Mission Madhumeha", through Ayurveda.

(Anurag Srivastava)

Foreword

Diabetes is a leading cause of mortality, morbidity, and health-system costs. The 2011 UN High-Level Meeting on Non-Communicable Diseases (NCDs) set a global target to halt the rise in the age-standardised adult prevalence of diabetes at its 2010 levels, by 2025. There were 69.1 million cases of diabetes in India in 2015. It is equally prevalent in male as well as female and urban as well as rural areas. The target organ damage like Nephropathy, Ratinopathy and angiopathy are mainly caused due to neglecting and poor control of the disease. Considering the rapid growth in number of diabetic patients, Hon'ble Prime Minister Shri Narendra Modi in his address of 2nd International Day of Yoga had asked to dedicate the efforts to scale up prevention, strengthen care, and enhance surveillance of diabetes through Ayurveda and Yoga.

In Ayurveda, the diabetes has been explained in detail under the broad umbrella of Prameha. Ayurveda has unique strength in prevention and control in diabetes due to its lipo-centric and individualized approach to the disease. However, the real potential of Ayurveda has not been exploited. Therefore, it was decided to select the “Prevention and Control of Diabetes through Ayurveda” as the theme for the year 2016-17.

The Ministry of AYUSH has decided to celebrate National Ayurveda Day on Dhanvantri jayanti every year. The “*Mission Madhumeha*” will be launched on the occasion of first National Ayurveda Day to be celebrated on 28th October, 2016. This protocol for “Prevention and Control of Diabetes through Ayurveda” has been prepared for implementing the “*Mission Madhumeha*”. An attempt has been made to bring out the Ayurvedic philosophy in implementable format. The tables about do’s and don’ts have been depicted with relevant figures for easy understanding of the community. The ‘*Madhumeha Assessment Tool*’ (MAT) based on Ayurvedic Philosophy has been developed for the first time for the self assessment of people with regard to possibility of diabetes. The intention of developing the *Madhumeha* assessment tool is to sensitise people about diabetes, its common symptoms, the Ayurvedic approach of *Medodushti* and its symptoms and to encourage them to visit an Ayurveda hospitals in case of having the score above the threshold. The specific diet and exercises explained in the protocol would be useful for the end user to promote self health. The treatment/ medicines explained for implementation at PHC/CHC/DH would provide the base line for the insurance coverage purpose also. The charts have been developed in easy downloadable format, which could be used for developing posters for display at places like Educational Institutes, Panchayat and such other relevant public places.

Besides the committee members listed above, many other Ayurveda experts have offered their expertise in developing this protocol. I am thankful to all the committee members, Dr. Mangla Gauri Rao, Associate Prof. (AIIA), Dr. Pramod Yadav, Assist. Prof. (AIIA), Dr. Bharti, Assist. Director (CCRAS), Dr. Lavaniya, RO (CCRAS), Dr. B.S. Sharma, RO (CCRAS) for their contribution in developing this protocol.

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BACKGROUND

प्रमेहोऽनुषङ्गिणां...

Prameho anuṣamgiṇī n...Caraka Samhita

Prameha/ Madhumeha¹ (Diabetes) is a serious, lifelong condition.

Diabetes touches almost every part of the life. It can cause various health problems over time- ranging from neuropathy to nephropathy to retinopathy. It causes impairment in the peripheral blood flow and micro vasculature and leads to end organ damage. Diabetes in pregnancy can cause other problems- both for the mother and the foetus. However, most of these problems can be prevented by timely action.

In the first century B.C.E., a Greek physician, Aretus the Cappadocian, coined the name *diabainein*, meaning "a siphon," referring to the excessive urination associated with the disease diabetes. In the western medicine, the word *diabetes* was first recorded in 1425. The Greek word *mellitus*, "like honey," was added in 1675, to reflect the sweet smell and taste of the patient's urine. However, the metaphor "Urine similar to honey" was extant centuries before that and is exactly reflected in the Ayurvedic term "Madhumeha" which literally means "honey-like urine".

Presently, in Ayurveda two terms are used interchangeably in context of diabetes- **Prameha** and **Madhumeha**.

Prameha means-

- An increase in amount of urine with or without increased frequency of micturition.
- Prabhutatva and Avilatva are the two common Lakshanas of all types of Pramehas
- Classification of Prameha is based on colour and other physical properties of urine.
- Prameha is a complex syndrome encompassing Obesity, Metabolic Syndrome and Diabetes Mellitus.
- All Prameha ultimately convert into Madhumeha. Thus, Madhumeha is an advanced stage of prameha.
- The terms Prameha and Madhumeha are to be considered synonymous in context of diabetes.

The term '*Prameha*' is derived from two words, 'Pra' meaning abundant, and 'Meha' meaning 'passing of large quantity of Urine'. Although the main presenting symptom of the disease is excess and sweet urine, it involves all

¹ Madhumeha is equated with Prameha. (Appendix 1)

the three doshas and 10 *dushyas* including *shukra* and *oja*. The complex nature of '*Prameha*' was well understood in the ancient time. Therefore, the disease is enlisted in '*Maha Roga*'. Unlike other diseases which have usually one type of pathogenesis, *Prameha/Madhumeha* has four different mechanisms. Although, *Prameha* is classification of diseases presenting with polyuria, in practice, often it equated with Diabetes owing to its high incidence. Never the less it is also called as *Madhumeha*.

National Ayurveda Day 2016: Key messages

1. The *Madhumeha* epidemic is rapidly increasing.
2. Most of the *Madhumeha* cases are preventable. Simple *Dinacharya* (lifestyle) measures have been shown to be effective in preventing or delaying the onset of *Madhumeha* (type 2 diabetes).
3. Maintaining normal body weight, engaging in regular physical activity, and eating a healthy diet can reduce the risk of *Madhumeha*.
4. *Madhumeha* is treatable. It can be controlled and managed to prevent complications.
5. Increasing access to diagnosis, self-management education and affordable treatment are vital components of the response.
6. Efforts to prevent and treat diabetes will be important to achieve the global Sustainable Development Goal 3 target of reducing premature mortality from noncommunicable diseases (NCDs) by one-third by 2030.
7. Many sectors of society have a role to play, including governments, employers, educators, manufacturers, civil society, private sector, the media and individuals themselves.
8. The *Swasthavritta* (Preventive & promotive health domain of Ayurveda) advocates daily regimens, seasonal regimens and code and conduct of living healthy
9. Ayurveda advocates various herbal and herbomineral drugs, *Panchakarma* procedures, *Rasayana* formulations
10. Integrating the preventive as well as therapeutic approaches of Ayurveda in the comprehensive care of Diabetes is a need of the time.

How Diabetes in India is different than that in Western Countries? ²

1. Young age of onset and diagnosis.
2. Body Mass Index (BMI) of a patient is low but they are centrally obese, which is the main cardiovascular risk factor.
3. Rapid progression from prediabetic stage (Impaired Glucose Tolerance) to Type II DM and Gestational Diabetes Mellitus (GDM) to type II DM.
4. It is possible to prevent the Diabetes or reverse it from pre-Diabetic stage through Lifestyle and Diet changes.

ADVANTAGE AYURVEDA

Scope for Ayurveda in the treatment of Type II diabetes

Ayurveda considers Prameha, as a disease of Medadhatu (Body Fats or adipose tissue) Dushti with additional derangement in mansadhatu (muscle tissue), Kleda, Rasadhatu, Raktadhatu, Majja, Shukra etc. Ayurvedic line of Treatment starts from correction of medadhatu dushti (Deranged Adipose Tissue), which is responsible for further Patho-physiology of Prameha.

Until recently, it was a belief of Modern Science, that Diabetes is a disease of deranged Carbohydrate Metabolism. But research in this field has highlighted the importance of lipid metabolism and its role in the development of diabetes.

Uniqueness of Ayurveda in the diagnosis and treatment of Prameha / Madhumeha:

- Causes are well described according to dosha dominance in Prameha / Madhumeha. These causes are mainly diet related, dietary routine related, lifestyle related and acquired.
- Pathophysiology (samprapti) of Prameha / Madhumeha is given in which process of medadushti and manifestation of Prameha is well understood.
- Twenty types of Prameha / Madhumeha are described as per characteristics of urine and urination. Few types are found even today. Twenty Medicinal combinations for treatment of each type is also suggested.

2. Type II Diabetes in South Asians: Similarities and Differences with white Caucasian and other population. Unjali P. Gujral; R Pradeepa, Mary Beth Weber, KM Venkat narayan and V Mohan; Ann N Y Acad Sci 2013 Apr, 1281(1): 51-63

- Prameha / Madhumeha Poorvaroop Avastha, which can be called as prediabetic stage, is well described. This stage can be diagnosed well before the actual manifestation of Prameha / Madhumeha. Charak Samhita suggests starting the treatment of Prameha / Madhumeha right at this stage.
- Ayurvedic Treatment line differs for obese and non-obese type of patients, Sanshodhan for obese and Shamana for obese and non-obese patients.
- Santarpana is a vital part in treatment
- Emphasis on the use of specific drugs and drug combinations is given. Few of them are Haridra Amalaki Yog, Sarvamehahara Kashaya, Shilajit, Suvarna Makshik etc.
- Dietary regime is a vital part. New research in the field of dietetics and Nutrition is supporting the Ayurvedic ideas of diet in Prameha / Madhumeha.
- Emphasis on exercise is given, Sushrut Samhita suggests even the type of exercise, which seem to improve muscle tone.
- Complications (Prameha / Madhumeha Upadrava) are classified according to Dosha types. Treatment of complications, especially carbuncles, nonhealing ulcers are described in details.
- Prognosis of the disease as per dosha type of Prameha / Madhumeha, duration of disease and seriousness of symptoms is given.
- Ayurveda describes Madhumeha, in which patient passes sweet urine. This is one of the pathways for manifestation of Prameha. Efforts are required to treat this condition. It can be regarded as Diabetes Mellitus. The advanced stage of the Prameha is also called Madhumeha, which is regarded as incurable.

Limitations of Conventional medicine:

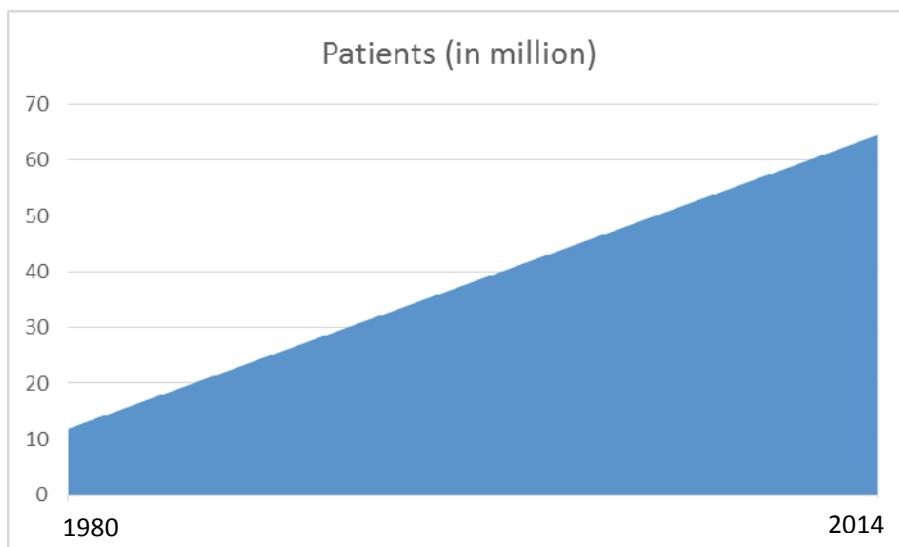
- Line of conventional treatment is based upon research done in western people.
- Progressive insulin resistance and beta cell failure cannot be stopped.
- Drug doses go on increasing. When one drug cannot control blood glucose levels, other drugs are added to achieve BSL targets. This is “Treating upto Failure”.
- Multiple drugs for treating associated conditions like Hypertension, dyslipidemia etc.

- Complications cannot be prevented, especially atherosclerosis and neuropathy.
 - Side effects of Modern Drug Therapy Example: Weight gain and Hypoglycemia with Sulphonyl Urea drugs and Insulin, Fluid retention & osteoporosis with Thiazolidinidiones (TZD), GI upset with Metformin and alpha glucosidase inhibitors.
- ❖ This National protocol is prepared with the following objectives-
- To promote use of Ayurveda for prevention of Diabetes.
 - To Generate Awareness about strengths of Ayurveda in Diabetes
 - Educate people for Self help
 - Improve surveillance
 - Effective management of Diabetes and its complications.

This 'National protocol for prevention and control of Diabetes through Ayurveda' will be implemented through the Public Health Infrastructure available under State Governments, Ayurveda colleges spread all over the country as well as through practitioners associations.

1. INTRODUCTION

Diabetes is a leading cause of mortality, morbidity, and health-system costs.^{1,2} The 2011 UN High-Level Meeting on Non-Communicable Diseases (NCDs) set a global target to halt the rise in the age-standardised adult prevalence of diabetes at its 2010 levels, by 2025.³ However, a recent Lancet study reported a fourfold rise in the number of diabetics – from 108 million in 1980 to 422 million in 2014. According to this study, China, India and USA are among the top three countries with a high number of diabetic population. The numbers climbed from 11.9 million in 1980 to 64.5 million in India.



Prevalence of diabetes has more than doubled for men in India (3.7 per cent to 9.1 per cent). It has also increased by 80 per cent among women in India (4.6 per cent to 8.3 per cent).⁴ This Lancet study was published online on 6th April 2016, a day ahead of the World health day- 7th April. The **theme** for the World Health Day 2016: “**Beat Diabetes**” and the **Goal: Scale up prevention, strengthen care, and enhance surveillance of diabetes.**

¹ Global Burden of Metabolic Risk Factors for Chronic Diseases Collaboration. Cardiovascular disease, chronic kidney disease, and diabetes mortality burden of cardiometabolic risk factors from 1980 to 2010: a comparative risk assessment. *Lancet Diabetes Endocrinol* 2014; 2: 634–47.

² Seuring T, Archangelidi O, Suhrk M. The economic costs of type 2 diabetes: a global systematic review. *Pharmacoeconomics* 2015; 33: 811–31.

³ WHO. Global action plan for the prevention and control of noncommunicable diseases 2013–2020. 2013. http://apps.who.int/iris/bitstream/10665/94384/1/9789241506236_eng.pdf?ua=1 (accessed Oct 11, 2016).

⁴ NCD Risk Factor Collaboration (NCD-RisC), Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4·4 million participants; *Lancet* 2016; 387: 1513–30
[http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736\(16\)00618-8.pdf](http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(16)00618-8.pdf) (accessed Oct 11, 2016).

2. AYURVEDIC CONCEPT OF DIABETES

The diseases afflicting urine are classified into two types⁵- Mutra Apravrittaja Rogas i.e. diseases leading to less quantity of urine and Mutratipravrittaja Rogas i.e. diseases leading to excess quantity of urine, Prameha being Mutratipravrittaja roga. Basti^{3,1} is the seat of both Mutraghata and Prameha.⁶ Prameha is further classified into 20 varieties based on physical abnormalities of urine. However, all Prameha if neglected may lead to Madhumeha in long term.⁷ *Iksumeha* and *Seetameha*, types of *Kaphajameha* which have *Mutra Madhurya* (Glycosurea) as the presenting feature, cause Dhatukshaya and vitiation of vata, resulting in Madhumeha in long run. Similarly, *Kaphapitta Kshaya* in a *Kapha-PittaPramehi* associated with chronicity and *Dhatukshaya* leads to aggravation of *Vata* resulting in *Madhumeha-aVataja Meha*.⁸

The observations of Acharya Susruta and Acharya Charaka were very specific while describing the types of Prameha on the basis of onset as *Sahaja / JatahaPramehi* and *Apathyanimittaja / Sthula Pramehi* respectively, which find similar connotations in contemporary science.

2.1 CLASSIFICATION OF PRAMEHA:

- A. According to Doṣa
- B. According to etiology
- C. According to body constitution
- D. According to prognosis:

A. Doṣika classification of prameha:

Types of Prameha

- **Kaphajameha**
 - Udagameha
 - Ikṣuvālikāmeha
 - Sāndrameha

⁵ इति विस्तरतः प्रोक्ता रोग मूत्राप्रवृत्तिजाः। निदानलक्षणैरुद्धर्वं वक्ष्यन्तेऽतिप्रवृत्तिजाः॥ Ast.Hri. Ni - 9/40

⁶ यैस्तैरेव प्रविश्यैनं दोषाः कुर्वन्ति विंशतिम्। मूत्राघातान् प्रमेहांश्च कृच्छ्रान्मर्मसमाश्रयान्॥३॥ Ast.Hri. Ni - 9/3

⁷ सर्व एव प्रमेहास्तु कालेनाप्रतिकुर्वतः। मधुमेहत्वमायान्ति तदाऽसाध्या भवन्ति हि ॥२७॥ Su. ni 6/27

⁸ क्षीणेषु दोषेष्ववकृष्य बस्तौ धातून् प्रमेहाननिलः करोति।

दोषो हि बस्तिं समुपेत्य मूत्रं सन्दृश्य मेहाङ्गजनयेद्यथास्वम्॥६॥ Ca. Ci - 6/6

- Sāndraprasādameha
- Śuklameha
- Śītameha
- Siktāmeha
- Śanairmeha
- Alālameha
- **Pittajameha**
- Kśārameha
- Kālameha
- Nīlameha
- Lohitameha
- Mañjiṣṭhāmeha
- Haridrāmeha

- **Vātajameha**
- Vasāmeha
- Majjāmeha
- Hastimeha
- Madhumeha

All these types result because of the nexus between doṣa, dūṣya and their specific combination.⁹

The above classification and nomenclature of each type are based on the specific qualities deranged in particular type and their combinations.¹⁰

Classification according to prognosis:

- | | |
|---|----------|
| Sādhya - Manageable with ease;good prognosis, | -Kaphaja |
| Yāpya - Manageable with moderate difficulty, | -Pittaja |
| Asādhya - difficult to manage, with bad prognosis; | -Vātaja |

⁹ ननु, दोषस्य-कफादेः, दूष्यस्य च-वपुःक्लेदादेः, तुल्यत्वात् कथं प्रतिदोषं प्रमेहानेकत्वं स्यात्

इत्याह दोषदूष्याविशेषेऽपि तत्संयोगविशेषतः॥७॥ मूत्रवर्णादिभेदेन भेदो मेहेषु कल्प्यते। A.H.Ni. 10/7: 8

¹⁰ शरीरक्लेदस्तु श्लेष्ममेदोमिश्रः प्रविशन् मूत्राशयं मूत्रत्वमापद्यमानः श्लैष्मकैरेभिर्दशभिर्गुणौरूपसृज्यते वैषम्ययुक्तैः; तद्यथा- श्वेतशीतमूर्तपिच्छलाच्छस्निग्धगुरुमधुरसान्द्रप्रसादमन्दैः, तत्र येन गुणेनैकेनानेकेन वा भूयस्तरमुपसृज्यते तत्समाच्यं गौणं नामविशेषं प्राप्नोति॥९॥ Ca.Ni. 4/ 9

This classification highlights the dosha predominance, state of the disease and progression.

B. Classification according to etiological factors:

i. Sahaja¹¹ /jātapramehi¹² (Hereditary)

Prameha of **Hereditary origin**, classified as kulaja vikara, arises out of bija-dosha is incurable in nature. Defects in bija and bijavayava imply defects in genetic material. This ancient observation finds resonance in the contemporary science.

ii. Apathyanimittaja¹³: (Acquired)

This subtype depends on the causes borne out of unhealthy habits. These causes can be further classified in terms of etiology and pathophysiology as:

a. Āvaraṇajanya and dhātu apakarṣaṇajanya:¹⁴

In this entity, āvaraṇajanya (obstruction to functions of Vata) pathogenesis occurs due to etiological factors mainly concordant with kapha and pitta. Dhātuapakarṣaṇajanya pathology occurs due to depletion of dhātū because of the vāta vitiated etiological factors.

b. Santarpaṇajanya and Apatarpaṇajanya¹⁵

This classification has an applied aspect in context of the treatment modalities of Prameha. Classification is mainly based upon the over-nutrition and under-nutrition. Santarpaṇajanya madhumeha correlates with āvaraṇajanya

¹¹ द्वौ प्रमेहो भवतः- सहजोऽपथ्यनिमित्तश्च|तत्र सहजो मातृपितृबीजदोषकृतः, अहिताहारजोऽपथ्यनिमित्तः | तयोः पूर्वेणोपद्रुतः कृशो रुक्षोऽल्पाशी पिपासुर्भृशं परिसरणशीलश्च भवति; उत्तरेण स्थूलो बहवाशी स्निग्धः शस्यासनस्वप्नशीलः प्रायेणेति ||३||Su.Ci. 11: 3

¹² जातः प्रमेही मधुमेहिनो वा न साध्य उक्तः स हि बीजदोषात्]

ये चापि केचित् कुलजा विकारा भवन्ति तांश्च प्रवदन्त्यसाध्यान्||७७||Ca.Ci. 6: 57

¹³ भवति चात्र- अधनो वैद्यसन्देशादेवं कुर्वन्नतन्द्रितः | संवत्सरादन्तराद्वा प्रमेहात् प्रतिमुच्यते ||१३|| Su.Chi.11/13

¹⁴ गुरुस्त्रिन्द्रियाम्ललवणान्यतिमात्रं समश्नताम्|नवमन्तं च पानं च निद्रामास्यासुखानि च||७८||

त्यक्तत्व्यायामचिन्तानां संशोधनमकुर्वताम्|श्लेष्मा पित्तं च मेदश्च मांसं चातिप्रवर्धते||७९||

तैरावृतगतिर्वायुरोज आदाय गच्छति| यदा बस्तिं तदा कृच्छ्रो मधुमेहः प्रवर्तते||८०||

स मारुतस्य पित्तस्य कफस्य च मुहुर्मुहुः| दर्शयत्याकृतिं गत्वा क्षयमाप्यायते पुनः||८१||Ca.Sū. 17: 78-81,

निशिस्थितानां त्रिफलाक्षाये स्युस्तर्पणाः क्षोद्रयुता यवानाम्|

तान् सीधुयुक्तान् प्रपिबेत् प्रमेही प्रायोगिकान्मेहवधार्थमेव||२२|| Ca.Ci. 6: 22,

कुद्दे धातुक्षयाद्वायौ दोषावृतपथेऽथवा| आवृतो दोषलिङ्गानि सोऽनिमित्तं प्रदर्शयेत्||१९||A.H.Ni. 10: 19

¹⁵ स्थूलः प्रमेही बलवानिहैकः कृशस्तथैकः परिदुर्बलश्च

सम्बूहण तत्र कृशस्य कार्यं संशोधनं दोषबलाधिकस्य||१५||Ch. Chi. 6: 15

madhumeha and Apatarpañajanya madhumeha correlates with dhātuapakarṣaṇajanya Madhumeha.

c. Anilātmaka and Kaphasambhava :

The urine of the patient is sweet and slimy like honey. This may occur because of two types of causative factors either Vātātmaka or Kaphasambhava.

2.2 MADHUMEHA

Definition of Madhumeha:

The word Madhumeha consists of two words:

1. Madhu and 2. Meha

In Samskrta literature the term madhu means honey. The disease in which the urine is similar to madhu (honey) in its colour, taste, smell and consistency is called madhumeha. It is the clinical entity in which even the body acquires sweetness. (Ca.Ni. 4: 44, A.H.Ni. 10: 18-21). The term Kśaudrameha is also used in place of madhumeha.¹⁶ Kśaudra is also a synonym of madhu (honey).

Other nearest terms:

Ojomeha is a subtype of vātaja prameha. The depletion of oja through the urine changing its taste and texture by vitiated vāta results in ojomeha. Change in qualities of oja is due to 'Vāta Prabhāva'. Kśaudrameha is a term used by Suśruta because of its close resemblance with honey. Puṣpameha is a term used in Añjana nidāna. Puṣparasa means honey.

Nature of the disease:

It is one among the eight Maharoga (disorders needing serious concern) and explained as most important among Anushangiroga (chronic disorders).

¹⁶ अत ऊर्ध्वं वातनिमित्तान् वक्ष्यामः- सर्पिःप्रकाशं सर्पिर्मेही मेहति; वसाप्रकाशं वसामेही; क्षौद्रसवर्णं क्षौद्रमेही; मत्तमातडगवदनुप्रबन्धं हस्तिमेही मेहति ||१२|| Suśruta (Su.Ni. 6: 12)

It is a disease with complex permutation combinations of various Dosha (Body Humours) and Dushya (Tissue elements) depending on the multiplicity of Nidana (etiological factors). Ayurveda has lipocentric approach to understand the pathogenesis of Madhumeha. Aggravated Kapha Dosha and Meda Dhatu as well as their fluidity are the two main factors involved in pathogenesis of Prameha. Increased Kleda, i.e. excess moisture in body tissues is responsible for increased fluidity of Kapha dosha (Bahudrava Shleshma) and Meda Dhatu (Bahu abaddha meda).

It is a disease affecting the Medovahasrotas (channels of lipid metabolism).

2.3 NIDĀNA (Causative Factors):

The etiology is multifactorial. Causes may be traced to tendencies inherited at birth or to derangements acquired afterwards.

General Causes:

Ācārya Caraka states that all those things that produce excessive kapha, meda, mūtra are causative factors-

“यश्चकर्षिद्विधिस्योऽपि श्लेषममेदो मूत्रसंजननः स सर्वोनिदानविशेषः ॥” (Ca.Ci. 4: 5)

All the āhāra-vihāra (Diet and lifestyle factors) having snigdha (unctuous), śīta (cold), guru (heavy), picchila (slimy), madhura (sweet), ślakṣṇa (smooth) properties, those which increase kapha and vitiate dūṣyāḥ are the causative factors of Madhumeha. These factors mainly cause excessive burden on metabolism at cellular level resulting in intermediate metabolites. The compromise metabolism leads to excess production of meda, kleda lasikā, mūtra, sveda and deposition of medha at various sites.

2.4 Purva-Rūpa and Rūpa (Clinical Features):

The disease is manifested as *Prabhootavilamootrata* (Polyuria with turbidity in urine). These are striking features which draw the attention of patient as well as clinician to suspect. Ayurveda has also explained certain *Purvarupa* (pre-monitory symptoms) which are actually long lasting and of high prognostic predictive value. These include the following symptoms:

1. *Alasya* (Laziness)
2. *Asyamadhura* (Sweet taste in the mouth)
3. *Deha-chikkannata* (feeling of stickiness in the body)
4. *Dantadinam maladhyatvam* (Slimy mucous deposit on tongue, palate, pharynx and teeth)
5. *Ghanangta* (Corpulence of the body /Feeling of heaviness)
6. *Gala-talu-shosha* (Dryness of throat and palate)
7. *Hrid-netra-jihva-shravana upadeha* (Feeling heaviness in chest and excessive secretions of eyes, tongue and ears.)
8. *Jatilibhavam kesheshu* (Matting of hairs)
9. *Kara-pada daha* (Burning sensation of palms and soles)
10. *Gurugatrata* (Heavyness of the body)
11. *Kara-pada suptata* (Numbness in hands and feet)
12. *Kaye malam* (Accumulation of waste products/exudates in various body parts)
13. *Kaya-chhidreshu upadeha* (Searing in body orifices)
14. *Kesha-nakha ativriddhi* (Excessive growth of hairs and nails)
15. *Madhura mutrata* (Sweetness of urine)
16. *Mukha shosha* (Dryness of mouth)
17. *Mutre mutra doshan* (Excretion of the abnormal constituents of the urine)
18. *Nidra sarvakalam* (Excessive sleep)
19. *Pipasa* (Polydypsia)
20. *Paridaha angeshu* (Burning sensation in body parts)
21. *Shithilangata* (Flabbiness/laxity of the body)
22. *Shayyasana-swapna sukhe Ratishcha* (Desire to sit and sleep)
23. *Shitapriyatavam* (desire for cold things)
24. *Shatpada-pipilikabhishtcha sharira-mutrabhisehanam* (Attraction /crawling of insects and ants to the body and urine)
25. *Shukla mutrata* (Turbid/ white urine)
26. *Sada* (Fatigue)
27. *Suptata angeshu* (Numbness in the body parts)
28. *Shvasa* (breathlessness)
29. *Sweda* (Increased perspiration)

30. *Snigdha-pichchhila-guru Gatrata* (Oiliness, sliminess and heaviness of the body)
31. *Tandra sarvakalam* (Drowsiness / somnolence)
32. *Visra shariragandham* (Odour of raw flesh/meat in the body)
33. *Durgandhascha Shwasaha* (Bad smell in the breath) (repetition of symptoms to be avoided)

A proper screening of above symptoms may yield an early diagnosis of the disease. Further continuing manifestation of these symptoms in patients make the prognosis of the disease as difficult.

2.5 SAMPRAPTI (Pathogenesis):-

Samprapti has relevance in context of the management: “Samprapti vighatanameva chikitsa”

DOṢA and other factors involved in the Samprapti of Madhumeha:-

Madhumeha is a disease caused by vitiation of all the three doshas.¹⁷

i. Kapha:- Kapha Doṣa is dominant and primarily vitiated because of its close resemblance with etiological factors.¹⁸ The *drava* property of *kapha* is mainly deranged in the body leading to its allover spread

Due to the vitiation of Kapha, symptoms such as aithilya, lasya, atinidr , Gaurava etc. develop.

Kleda¹⁹: The total fluid content (jalamaḥabhoṭa) in the body is represented as Uduka²⁰. The constituents of uduka are Ambu (water consumed), Rasa

¹⁷ त्रिदोषकोपनिमित्ता विंशति: प्रमेहा भवन्ति विकाराश्चापरेऽपरिसङ्खयेयाः। तत्र यथा त्रिदोषप्रकोपः प्रमेहानभिन्निर्वर्तयति तथाऽनुव्याख्यास्यामः॥३॥ Ch.Ni.4/3

¹⁸ तत्रेमे त्रयो निदानादिविशेषाः ६लेष्मनिमित्तानां प्रमेहाणामाश्वभिन्निर्वृत्तिकरा भवन्ति; तद्यथा-हायनकयवकचीनकोद्वालकनैषधेत्कटमुकुन्दकमहाग्रीहिप्रमोदकसुगन्धकानां नवानामतिवेलमतिप्रमाणेन चोपयोगः; तथा सर्पिष्मतां नवहरेणुमाषसूप्यानां, ग्राम्यानूपौदकानां च मांसानां, शाकतिलपलपिष्टान्नपायसकृशराविलेपीक्षुविकाराणां, क्षीरनवमदयमन्दकदिघिद्रवमधुरतरुणप्रायाणां चोपयोगः, मृजाव्यायामवर्जनं, स्वप्नशयनासनप्रसङ्गः, यश्च कश्चिद् विधिरन्योऽपि ६लेष्ममेदोमूत्रसञ्जननः, स सर्वो निदानविशेषः॥५॥ Ch. Ni. 4/5

¹⁹ Kleda कषायो रसः संशमनः सङ्ग्राही सन्धानकरः पीडनो रोपणः शोषणः स्तम्भनः ६लेष्मरक्तपित्तप्रशमनः शरीरक्लेदस्योपयोक्ता रुक्षः शीतोऽलघुश्च स एवङ्गुणोऽप्येक एवात्यर्थमुपयुज्यमान आस्यं शोषयति, हृदयं पीडयति, उदरमाध्मापयति, वाचं निगृहणाति, स्रोतांस्यवबृद्धनाति, श्यावत्वमापादयति, पुस्त्वमुपहन्ति, विष्टभ्य जरां गच्छति, वातमूत्रपुरीषरेतांस्यवगृहणाति, कर्शयति, ग्लपयति, तर्षयति, स्तम्भयति, खरविशदरुक्षत्वात् पक्षवधग्रहापतानकार्दितप्रभृतीश्च वातविकारानुपजनयति॥४३॥(CS. Sū. 26.43 (6)); तत्र तु खल्वेषामूष्मादीनामाहारपरिणामकराणां भावानामिमे कर्मविशेषा भवन्ति। तद्यथा-ऊष्मा पचति, वायुरपकर्षति,

(tissue nutrient), laseeka (lymph), kleda (intermediary fluid part), sweda (sweat) and mutra (urine). Ambu, the water consumed get absorbed after proper digestion (saarakittavibhajana) along with nutrients as rasa (tissue nutrients). This rasa nourishes the body tissues and get converted into laseeka (lymph). It is also explained as serum which exudes from the skin in superficial abrasion.²¹ Ambu, rasa, laseeka, and kleda fall under the category of Kapha.

Kleda is the fluid content which imparts ardrata (moistness) in the various body parts. It is considered as one among the essential requirements for proper digestion of food (aharaparinamakarabhava) (Ca. Sa. 6/14). An optimal amount of kleda is essential for good digestion. It is provided by Kledaka kapha which resides in Amashaya (AH SU. 12/15). Further the presence of kleda imparts appropriate soothing and wetness to skin, eyes, orifices etc. If kleda is reduced it makes the skin wrinkled and dry, dryness of eyes and loss of mucous in orifices. If it is excess it leads increased wetness in skin and secretions in orifices. The amount of kleda in the body is balance by removal of excess kleda from the body in the form of mutra (urine) by kidneys (AH Su.11/5). Sweda (sweat) does not convey kleda, rather retain it.

In pathogenesis of Prameha various factors like excess consumption of diet aggravating Kapha and meda, increased fluid intake etc. leads to aggravation of Kleda afflicted with all tissue elements. Since the only option for eliminating excess kleda is through urine, the aggravation of kleda causes excess urine formation and manifest as polyuria (Ca. Ni.4/8). Further the excessively aggravated kleda getting afflicted with increased mamsa leads to carbuncles (pidaka). In advanced conditions, the transportation of kleda along with mutra is associated with presence of laseeka also (Ca. Ni.4/37).

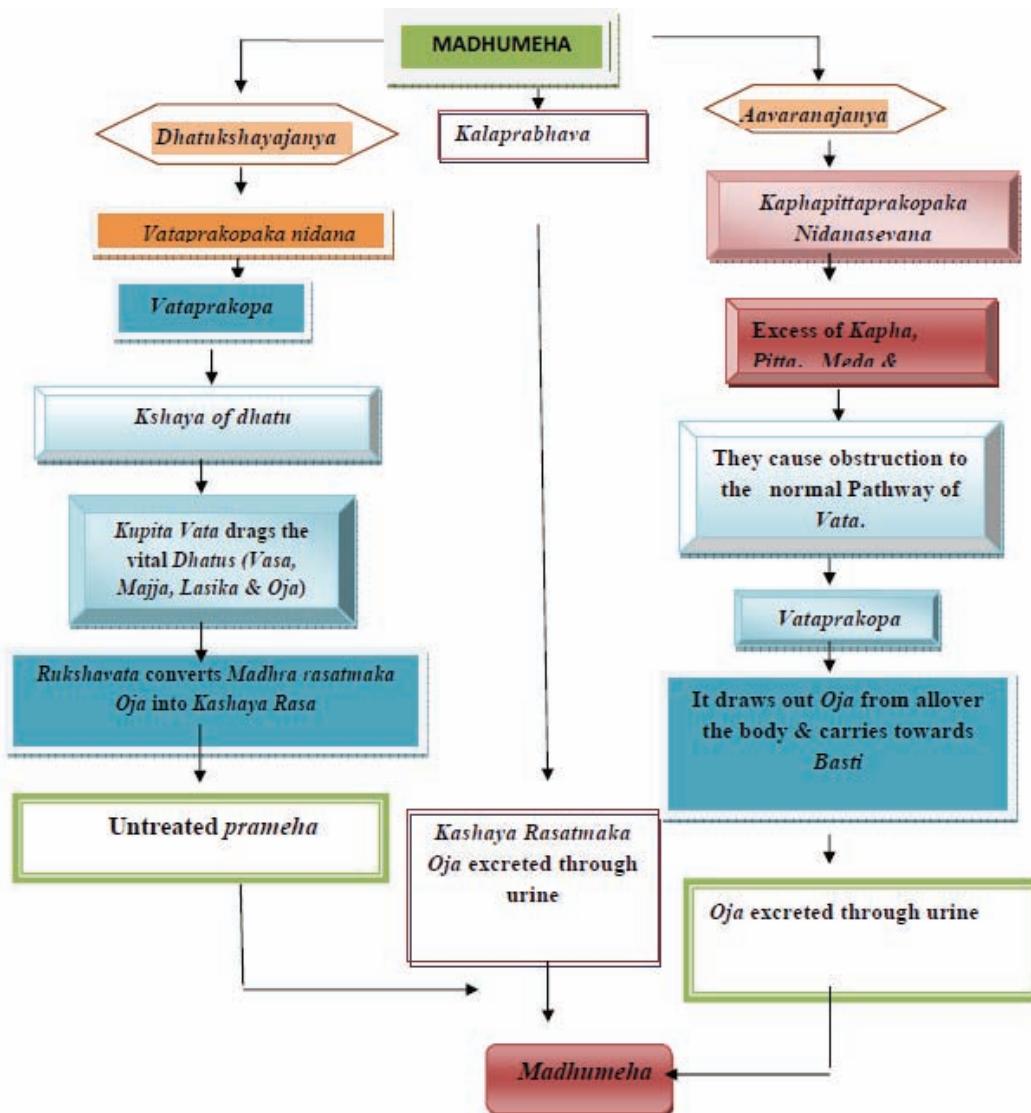
The chronological Samprapti can be summarized as follows:

क्लेदः शैथिल्यमापादयति, स्नेहो मार्दवं जनयति, कालः पर्याप्तिमभिनिर्वर्तयति, समयोगस्त्वेषां परिणामधातुसाम्यकरः सम्पद्यते॥१५॥ CS. Sa. 6.15;- न च विकेशिकौषधे अतिस्निग्धे अतिरुक्षे विषमे वा कुर्वीत; यस्मादतिस्नेहात् क्लेदो, गैक्याच्छेदो, दुर्योसाद्व्रणवर्त्मावर्घषणमिति ॥२१॥ SS. Su. 18.21; CS. Su. 17. 84

²⁰ यत्त्वञ्जलिसङ्ख्येयं तदुपदेक्ष्यामः; तत् परं प्रमाणमभिज्ञेयं, तच्च वृद्धिहासयोगि, तकर्यमेव। Ca. Sa. 7/15

²¹ तद्यथा- दशोदकस्याञ्जलयः शरीरे स्वेनाञ्जलिप्रमाणेन, यत्तु प्रच्यवमानं पुरीषमनुबृद्धनात्यतियोगेन तथा मूत्रं रुधिरमन्यांशं शरीरधातून्, यत्तु सर्वशरीरधरं बाह्या त्वग्विभर्ति, यत्तु त्वगन्तरे व्रणगतं लसीकाशब्दं लभते, यच्चोष्मणाऽनुबृद्दं लोमकूपेभ्यो निष्पतत् स्वेदशब्दमवाप्नोति, तदुदकं दशाञ्जलिप्रमाणां; नवाञ्जलयः पूर्वस्याहारपरिणामधातोः, यं 'रस' इत्याचक्षते; अष्टौ शोणितस्य, सप्त पुरीषस्य, षट् श्लेष्मणः, पञ्च पित्तस्य, चत्वारो मूत्रस्य, त्रयो वसायाः, द्वौ मेदसः; एको मज्जायाः, मस्तिष्कस्यार्धाञ्जलिः, शुक्रस्य तावदेव प्रमाणं, तावदेव श्लैष्मिकस्यौजस इति।एतच्छरीरतत्त्वमुक्तम्॥१५॥ Ca.Sa.7/15

1. Nidana (causative factors)
2. Dosha dushti (aggravation of dosha)
3. Enter medas (natural tendency)
4. Meda vilayana (liquefaction of fatty tissue) due to Pitta
5. Kleda vriddhi (increased extracellular fluid level in the body)
6. Excess Kleda shifts to basti (urinary system) – creates load
7. Gradually involves all dhatus (Mamsa, Majja etc.) – leading to Dhatu shaithilya
8. Involvement of other dosha – resulting in various types of madhumeha



SAMPRAPTI OF MADHUMEHA IN THE LIGHT OF KRIYAKALA

	Risk Factors	Symptoms	Modern Explanation / Investigation	Management Strategy
Sanchaya	Consumption of excessive heavy to digest, oily, Sweet, sour and salt diet, sedentary life style, day sleep	Cold intolerance, Recurrent respiratory discomforts, Laziness, Sleepy, Feeling of heaviness in the body	High risk factors like sedentary life style, over nutrition, Abnormal Fasting lipid profile	Life style modifications, Following Ayurvedic Dinacharya, Ritucharya, Shleshma viruddha Upakrama especially like regular udwarhana, vyayama, langhana as upavasa etc
Prakopa	Above plus Drava atisevana, Madhura Atisevana, Medura Ahara	Sweda Adhikya, Sthoola Laxana, Exertional dyspnoes (alpei cheshtite swasam, sphik stanodara lambanam)	Prediabetic Abnormal GTT, GCT in Pregnancy	Primary Prevention, Life style modifications, Sthoulya Chikitsa, Consumption of Thikta rasa
Prasar a	Above + Stress, Ushna	Karapada daha, Some poorvarupa	Abnormal GTT, FBS= 100-125	Above + Nisha Amalaki prayoga for prevention
Sthana samskra	Continuing above nidana +Mutrala ahara	Full-fledged poorvaroopa, Kapha prameha Upadrava,	Early Diabetic, FBS < 125 PPBS< 160	Kapha Prameha Chikitsa + Secondary prevention
Vyakti	Above + Rakta pradoshakara nidana	Prabhoota Avila mutrata, Loosing weight, Pitta Prameha Upadrava	Persistent Glycosuria , FBS <180	Pitta Prameha Chikitsa, Secondary prevention,

Bheda	Above + Apatarpana type of nidana like severe diet control, excessive medication	Above + Karshya + Vata prameha Upadrava	Uncontrolled High BSL, Chronic diabetic with complication like neuro, nephro, retinopathy, Macroalbuminuria, Ketosis	Territory Prevention, Dhanwantahram Ghritam Vasantakusumakara, Chandraprabha etc
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2.6 Prognosis of Madhumeha:

Madhumeha or prameha has been described as anushangi which means it is punarbhavi in other words once a madhumehi will be so always throughout his life. Therefore one should make all efforts to prevent and control it. As described earlier Madhumeha passes through 3 stages of severity based on involvement of dhatus accordingly the sadhya asadhyata has been described.

Kaphaja meha usually having good prognosis on association with all poorvaroopa attains bad prognosis. Similarly Pittaja Prameha usually considered as Yanya attains bad prognosis (Pratyakhya) when associated with all poorvaroopa.

Sometimes the pittaja meha can also be sadhya when dhatu kshaya is not Atishaya, which has been termed as Avastha Sadhya. In such situations the pittaja meha becomes Asadhyta and in later stages when pittaja mehas are yanya, they attain pratyakeya Avastha when associated with poorvaroopas.

The severity of Asadhyata increases when associated with poorvaroopas Vataja pramehas have already been described as Asadhyta but this term has to be analytically interpreted in the two clinical types of Vataja mehas i.e. Dhatus Kshaya Janya and Margavarana Janya.

Sadhyata of Kaphaja Pramehas: The ten-kaphaja pramehas are described as sadhya because of the following reasons.

1. Samakriyatvat
2. Atishaya medho na dustatvat

Yapyata of pittaja pramehas: The 6-pittaja pramehas are described as yanya because of following reasons

1. Vishama kriyatvat
2. Atrapi atishayena medo na dustavat
3. Samsrustha dosha medo sthanatvat

Asadhyatha of vataja pramehas: the four-vataja pramehas are considered asadhyा due to the following reasons.

A) Mahatyayikatvat: the term mahatyaya has following interpretations

1. Mahata gambhira dhatunam atyaya nasko yena sa
2. Ashukaritva
3. Mahavyapatti katrakatva
4. Majja prabrti sarabhoota dhatukshaya
5. Majjadi gambhira dhatu apakarshakatvena
6. Uttarottara saratara dhatu sravakatvat

The above interpretations indicate the fatality of the disease, where all dhatus including the gambhira dhatus undergo nasha, kshaya, sravana and apakarshana.

This process involves multiple srotases producing upadravas and is hence mahavyapathikara, which means that the disease is much too fatal to sustain life. Moreover it is ashukari and sheegrakari which indicates the rapidity of the fatality in the patient, which is why the authors advice the physician not to bother much in handling the patient as disease transcends all boundaries of management.

B) Virudhopakramatvat: the chikitsa of vataja prameha involves virudhopakrama which means there is a mutual contradiction in the treatment modalities as use of snigdha etc are pathya for vata but apathyā for medas. Hence the disease is asadhyā.

2.7 APPROACH TO THE PATIENT

It is important for a vaidya to understand that Prameha can involve almost all Dhatus in the pathogenesis depending upon the stage of the disease. Therefore, besides the conventional approach to Diabetes, the vaidya should attempt to assess the person for understanding extent of Dosha involvement, Dhatu involved in pathogenesis, stage (avastha) of involvement

etc. The attending Vaidya should specifically look for assessment of Kleda, Meda, followed by involvement other dushyas. Further, time should be devoted for explaining the patient about the disease, possibility of reversal in case of early stage of disease, importance of diet and lifestyle, time to time visit to Vaidya to assess the status of intervention.

Patient should be explained about complications of Diabetes, measures to be adopted for secondary prevention etc. While assessing the patient's condition and status of disease progress on Ayurvedic parameters, conventional lab parameters should not be ignored. It would relevant to explain the person with the audio-visual aids, charts etc. which would help any body irrespective of language bar, religion, age, gender etc.

Each such visit is an opportunity to assess and improve the patient's understanding of their illness, and their ability to control the disease.

Aims of assessing the patient with diabetes

- To educate and enable the patient to monitor and manage their diabetes.
- To assess and improve any problems in glycaemic control.
- To detect and treat any complications of diabetes.
- To educate and emphasise healthy lifestyle.

To provide support and advice alter their lifestyle to maintain their health.

A checklist for a routine review of the patient with diabetes:

Prashna Pariksha (History)

A lot of information can be gathered if a detailed history is taken and all the information below is discussed at the review:

Awareness, Education and Self-management:

- How is the patient coping with self-care and self-management of diabetes?
- Does the patient eat a healthy diet?
- Do they feel sufficiently informed about how to manage their diet and its relationship to their drug regimen?
- Is the patient a smoker? If so, what help would they like to become a non-smoker and are they aware of the importance of stopping smoking?

- What is the status of Vyayama (Exercise)? Any active exercise plan with special reference to diabetes?

Upadraava (Complications)

- Has the patient had any-
- Hospital admissions in the preceding year for diabetic decompensations such as hypoglycaemia, Diabetic ketoacidosis?
- Treatment or hospital admissions in the preceding year for complications of their diabetes such as, angina/myocardial infarction, cerebrovascular event/transient ischaemic attack (TIA), diabetic foot, retinopathy, nephropathy, neuropathy?
- Symptoms of cardiovascular, cerebrovascular, renal, ophthalmological or neurological complications of diabetes?
- Problems such as Alpa Maithuna (Sexual dysfunction)? Erectile dysfunction?
- Problem with mood, Depression?

Chikitsa (Treatment):

- How is the patient coping and complying with the medication regimen?
- Any adverse effects?

Monitoring:

- Any problems with the equipment that they have to monitor their capillary glucose?
- When did they last calibrate their glucose monitoring equipment?
- Do they have their records of their blood glucose monitoring?

Pregnancy and pre-pregnancy:

- Are they pregnant or planning on having any children?

Ensure effective pre-pregnancy care and care during the pregnancy.

Examination

Patient should be clinically examined in terms of-

Medas, Rakta, Shukra, Ambu, Vasa, Lasika, Majja, Rasa, Ojas and Mamsa and Kleda^{22,23}

- **Medas (Lipid Metabolism), Bahubaddha Medas (Dyslipedemia)**
- Chala Sphik - Udara – Stana²⁴ (Pendulous Hips, Abdomen and breasts), Weight, abdominal circumference, height and BMI.
- Urinalysis for ketones, protein and nitrite.
- Clinical Features²⁵:
 - Trṣā/Pipasa (Thirst)
 - Moha (Drowsiness)
 - Svapna (Sleepiness)
 - Kṣut (Voracious Appetite)
 - Sveda (Excessive Sweating)
 - Daurgandhya (Bad Odour From Body)
 - Alpa Prāṇa (Decreased work capacity),
 - Daurbalya(Weakness)
 - Gaurava (Heaviness)

Cardiovascular:

- Check pulse and blood pressure.
- Examine for Kṣudraśvāsa (Dyspnoea)
- Check Krathana (Sudden Obstructive Respiration)
- Listen for carotid bruits and to heart sounds/lung fields if there is any history consistent with cerebrovascular or cardiac illness.
- Palpate and record the peripheral pulses of the feet.

Eyes:

- Inspect eyes, looking for any evidence of xanthelasmata, cataract formation or ophthalmoplegia.
- Check visual acuity, with distance vision glasses, if worn.
- Carry out ophthalmoscopy, preferably with dilated eyes

²² कफः सपित्तः पवनश्च दोषा मेदोऽस्तुक्राम्बुवसालसीकाः।
मज्जा रसौजः पिशितं च दूष्याः प्रमेहिणां, विशतिरेव मेहाः॥ (Ch.Chi.6/8)

²³ बहुवबद्धं मेदो मांसं शरीरजक्लेदः शुक्रं शोणितं वसा मज्जा लसीका रसशौजः सङ्ख्यात इति
दूष्यविशेषाः॥ (Ch.Ni.4/7)

²⁴ मेदोमांसातिवृद्धत्वाच्चलस्फिगुदरस्तनः।
अयथोपचयोत्साहो नरोऽतिस्थूल उच्यते ||9|| (माधवनिदान - 34. मेदोरोगनिदानम्; च.सू. 21/9)

²⁵ मेदस्तु चीयते तस्मादशक्तः सर्वकर्मसु ||2||
क्षुद्रश्वासतृष्णामोहस्वप्नक्रथनसादनैः।
युक्तः क्षुत्स्वेददुर्गन्धैरल्पप्राणोऽल्पमैथुनः ||3|| (माधवनिदान - 34. मेदोरोगनिदानम्)

Neuropathy:

- Examine the legs for evidence of diabetic amyotrophy.
- Check peripheral limb sensation.
- Check ankle and knee reflexes.
- Inspect the feet carefully for any evidence of peripheral neuropathy causing deformity and ulceration, or hypoperfusion due to peripheral vascular disease.

Blood and urine results

- HbA1c,, check when last done.
- Home glucose monitoring results.
- Non-fasting lipid profile.
- Urine testing for Microalbuminuria and albumin:creatinine ratio - ACR
- Estimated glomerular filtration rate to look for diabetic Nephropathy.

Medication review

- Current medication and doses for diabetes.
- Current medication for other conditions.

Ayurvedic Care for prevention and control of Diabetes mellitus:

A] Before Diagnosis of Pre-Diabetes/ Diabetes (when BSL levels are within normal limits).

Step 1: Screening should be done in context of signs of **meda dushti**. Self-examination should be taught in schools as a part of curriculum as well as to the healthy adults. Routine Medical check-ups in school, colleges and corporate sectors should include this examination. Following examination should be undertaken:

2.8 Madhumeha Assessment Tool (MAT)

Please answer the following questions

S.No.	Questionnaire	Score	
		Yes = 1	No = 0
1.	Is your age more than 45 years?		
2.	Do you have family history of Diabetes?		
3.	Have you ever been found to have high blood glucose (eg. during an illness, during pregnancy)?		
4.	Do you lead a sedentary life style?		
5.	Are you increasingly gaining weight recently?		
6.	Do you feel that your work capacity is reduced recently?		
7.	Do you feel flabbiness of body-parts? ²⁶		
8.	Do you feel tired, exhausted and sleepy always? ²⁶		
9.	Do you feel excessive Sweating and bad odour from your body recently? ²⁷		
10.	Do you feel increased thirst and dryness of mouth-palate-throat? ²⁸		
11.	Do you regularly wakeup late in morning and/or have habit of sleeping in day time?		
12.	Do you regularly eat sweets, Items of Maida, junk food, Canned fruit juices, cold drinks etc.?		
13.	Do you consume Alcohol at least 4 times a week?		
14.	Do you feel increased sliminess/stickiness in body, discharge in the eyes, wax collection in ears, coating over teeth/tongue?		
15.	Do you wake up at night for urine?		
16.	Have you noticed any abnormality in your urine recently? ²⁹ (eg. frequency/quantity/color/smell etc.)		
17.	Do you get boils frequently over body?		
18.	Measure your waist circumference For Adult Male – Do you have a waist circumference greater than 94 cm? For Adult Female -- Do you have a waist circumference greater than 80 cm?		
19.	Calculate your Body Mass Index [The index is calculated by dividing weight (kg) by the square of height (m). For example, if your height is 165 cm and your weight 70 kg, your body-mass index will be $70/(1.65 \times 1.65)$, or 25.7.] Is your BMI greater than 25		
	Total Score		

Note : If you have a score above 10, seek help from the nearest Ayurveda doctor for Diabetes checkup.

²⁶ अतिस्थूलस्य तावदायुषो ह्नासो जवोपराधः कृच्छ्रव्यवायता दौर्बल्यं दौर्गन्धं स्वेदाबाधः क्षुद्रतिमात्रं

पिपासातियोगश्चेति भवन्त्यष्टौ दोषाः | (Ch.Su.21/4)

²⁷ स्वेदोऽङ्गगन्धः शिथिलाङ्गता च शय्यासनस्वप्नसुखे रतिश्च |

हृन्नेत्रजिह्वाश्रवणोपदेहो घनाङ्गता केशनखातिवृद्धिः ||

शीतप्रियत्वं गलतालुशोषो माधुर्यमास्ये करपाददाहः |

भविष्यतो मेहगदस्य रूपं मूत्रेऽभिधावनित पिपीलिकाश्च | | (Ch.Chi.6/13-14)

²⁸ पूर्वरूपाणि दर्शयन्ति; तद्यथा- जटिलीभावं केशेषु, माधुर्यमास्यस्य, करपादयोः सुप्ततादाहौ, मुखतालुकण्ठशोषं, पिपासाम्, आलस्यं, मलं काये, कायच्छिद्रेषूपदेहं, परिदाहं सुप्ततां चाङ्गेषु, षट्पदपिपीलिकाभिश्च शरीरमूत्राभिसरणं, मूत्रे च मूत्रदोषान्, विसं शरीरगन्धं, निद्रां, तन्द्रां च सर्वकालमिति | | (Ch.Ni.4/47)

²⁹ मूत्रवहानां सोतसां बस्तिर्मूलं वडक्षणो च, प्रदुष्टानां तु खल्वेषामिदं विशेषविजानं भवति; तद्यथा- अतिसृष्टमतिबद्धं

प्रकुपितमल्पात्पमभीक्षणं वा बहलं सशूलं मूत्रयन्तं दृष्ट्वा मूत्रवहान्यस्य सोतांसि प्रदुष्टानीति विद्यात् | (Ch. Vi.5/8)

Some parameters adapted from The Finnish Type 2 Diabetes Risk Assessment Form

(http://www.idf.org/webdata/docs/FINDRISC_English.pdf)

Further testing and intervention:

If a person is found to be in high risk group on the **MAT (Madhumeha assessment tool)**, s/he should undergo:

1. Periodic Biochemical examination:
 - Plasma Glucose levels (fasting and PP)
 - Plasma lipids (cholesterol and triglycerides)
 - Plasma insulin levels (if, plasma glucose levels are within normal range)
2. Lifestyle intervention: Diet and Exercise and ayurvedic drugs, if symptoms are prominent
3. Prophylactic Panchakarma: After proper assessment

“One of every four people with diabetes doesn't know they have it”³⁰

2.9 Primary prevention-

पथ्येसति गदार्तस्य किमौषधं निषेवनैः

पथ्येऽसति गदार्तस्य किमौषधं निषेवनैः

- लोलिम्बराज

If there is *Pathya*, there is no further need of medicine; if there is no *Pathya*, medicine is futile. (Lolimbaraja in Vaidyajeevan)

The main target is to prevent *meda, kleda and kapha dushti*;

Prameha nidana parivarjana should be done

- Appropriate Dinacharya
- Appropriate Ahara
- Vigorous Vyayama
- Yoga Protocol

³⁰www.cdc.gov/features/diabetesfactsheet/

The dietary articles and activities contraindicated in diabetes:³¹



2.9.1 PRAMEHA Don'ts

The lifestyle better avoided...

Aharaja Apathya(Dietary factors to be avoided in excess)

<p>✗ Shuka Dhanya (Cereals)</p> <p>✗ White Newly harvested Rice (within One year) & its preparations, Aromatic Rice (Basmati)</p> <p>✗ Maida & its preparations</p> <p>✗ Bread, Noodles, Pasta, Maida biscuits, Maida</p> <p>✗ Murukku, Maida Chapati, Maida Barfi, Puri</p> <p>✗ Jalebi</p>	          
<p>✗ Shami Dhanya (Pulses)</p> <p>✗ Black Tila (Sesame)</p>	  

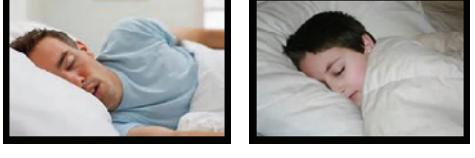
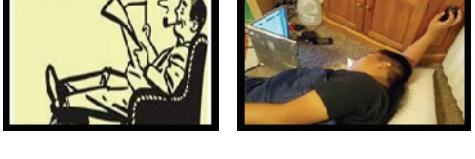
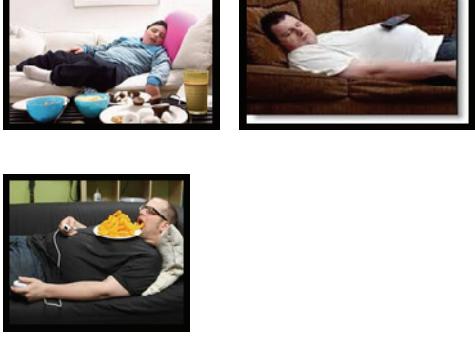
³¹ Ref. Ca. Ci. 6/4, Su. Ni.6/3, A. H. Ni. 10 /1-2

<ul style="list-style-type: none"> ✗ Masha (Udad/ black gram & its preparations ✗ Rajamasha (Cow pea), Matara (Pea) ✗ Papad, Idli, Dosa ✗ Dhokla, Meduvada 	    
<ul style="list-style-type: none"> ✗ Mamsa Varga (Non-veg) ✗ Gramyaudakanuparasa (meat soup of the domestic, aquatic and marshy animals) ✗ Meat soup of pork, buffalo, fish etc. 	     
<ul style="list-style-type: none"> ✗ Phala Varga (Fruits) ✗ Banana, Custard apple, Jack fruit ✗ Grapes, Dates, Plum ✗ Pineapple, Mango ✗ Papaya, ✗ Watermelon, Guava, Sapota 	        

	  
<p>✗ <i>Shaka Varga: Kanda (tubers)</i></p> <p>✗ Potato, sweet potato, beetroot, cabbage and its preparations</p> <p>✗ Alusabji, French fries, Chips, Alutikki ...</p>	        
<p>✗ <i>MadyaVarga (Drink)</i></p> <p>✗ <i>Navamadyapana</i> (freshly brewed alcoholic drinks) Sweet alcoholic drinks</p> <p>✗ Better to avoid all kinds of alcohol</p>	 
<p>✗ <i>Pana (Water)</i></p> <p>✗ <i>Varsha Ritu Jala, Soft drinks, Soda, Cold drinks</i></p>	 

<p>✗ Sweet fruit juices</p>	
<p>✗ Gorasa Varga (Dairy products)</p>	
<p>✗ <i>Dugdha</i> (Milk), <i>Dadhi</i> (Curd), Butter, Cheese ✗ Ghrita (ghee) ✗ Milk preparations eg. Paneer, Kheer, Ice-creams ✗ Shrikhand, Rabdi</p>	 
<p>✗ Ikshuvikara (Jaggery and its preparations) ✗ Jaggery ✗ Sugar</p>	
<p>✗ Navanna (new/fresh grains, cereals) ✗ Cereals and grains that are less than one year</p>	

old	
-----	--

Viharaja Apathya (Lifestyle factors to be avoided in excess)	
✗ Atimatra sevana (excessive eating)	
✗ Aasyasukham (enjoying the pleasure of continuous sitting)	
✗ Swapnasukham (enjoying the pleasure of excessive sleeping)	
✗ Avyayam (lack of exercise and physical activity)	
✗ Diwaswapa (sleeping in the daytime/afternoon) ✗ Aalasya(laziness)	

2.9.2 PRAMEHA "Do's"

Aharajapathya (Dietary factors to be partaken)

- ✓ **Shuka Dhanya (Cereals)**
- ✓ **Yava (Barley) (*Hordeum vulgare*)**
- ✓ **Godhuma (wheat)**
- ✓ **Kodrava (grain variety - *Paspolum scrobiculatum*)**
- ✓ **Uddalaka (forest variety of kodrava)**
- ✓ **Kangu (*Seteria italica*)**
- ✓ **Madhulika (*Eleusinecoracana*)**
- ✓ **Vajranna (*Pennisetum typhoides*)**
- ✓ **Jurnahva (*Sorghum vulgare*)**
- ✓ **Shyamaka (*Echinochloa frumentacea*)**

- ✓ **Puranashali (old rice one year after harvesting)**



✓ *Shami*

Dhanya(Pulses)

- ✓ *Adhaki* (red gram-
Cajamuscajan),
- ✓ *Kulattha* (horse gram)
and
- ✓ *Mudga* (green gram)
should be taken with
bitter and astringent
leafy vegetables.
- ✓ *Makushtha*
(*Vignaaconitifolia*)



MamsaVarga(Non-veg)

- ✓ birds like kapota (pigeon), Titira (Grey Francolin)
- ✓ Lean meat



PhalaVarga (Fruits)

- ✓ Jambu(*Syzygiumcumini*)
- ✓ Amalaki(*Phyllanthusembilica*)



- ✓ Kapitha(*Feronia limonia*),



Parushaka
(*GreviaAsiatica*)



Vrikshamla
(*Garceniamorella*)



Bilva (Aegle marmelos)



Udumbara (*Ficus glomerata*)
Naranga (Oranges)

○ Jambeera (*Citrus Lemon*)

○ Dadima
(*Punicagranatum*)



Vegetables

- ✓ Navapatola(young *Tricosanthusdioica*)
- ✓



✓ **Vastukam(bathuva)**



✓ All bitter vegetables
(*tiktasakam*) like *Methika*
(Fenugreek leaves and
seeds)



✓ **Karavellaka** (Bitter gourd)



✓ **Marisha/Tanduliyaka**
(*Amaranthusblitumour*)



✓ **Putiha** (*Mentha spicata*)



✓ **Shigru** (*Moringa oleifra*)

✓ *Vrintaka (Solanum melongena)*



✓ *Patola (Trichosanthes dioica)*



✓ *Bimbi (Coccinia indica)*



✓ *Surana
(Amorphophallus companulatus)*



✓ *Alabu (Lagenaria siceraria)*



✓ *Palundu (Allium cepa)*



✓ *Kritavedhana (Luffa acutangula)*



<ul style="list-style-type: none"> ✓ <i>Kushmanda</i> <i>(Binincasahispida)</i> ✓ <i>Mulaka</i> (<i>Raphanussativus</i>) ✓ <i>Grinjanaka</i> <i>(DaucaasCarotavarsativa)</i> ✓ NishpavaBheda (Cluster beans) ✓ Karkati (Cucumber) 	    
<ul style="list-style-type: none"> ✓ Oils ✓ <i>atasi</i>(<i>Linumusitatisimum</i>), ✓ <i>sarshapa</i>(mustard). 	 
<ul style="list-style-type: none"> ✓ <i>Go Dugdha</i>(Cow's Milk) treated with turmeric ✓ <i>Takra</i> (<i>Butter milk</i>) 	



Haridra (Turmeric)
Maricha (Pepper)



Tvak (Cinnamon)
Lashuna (Garlic)



Shunthi (Ginger)
Dhanyaka (Coriandrum)



Jeeraka (Cumin seeds)
Methika (Fenugreek)



Viharajapatha(Lifestyle to be adopted)

- ✓ *Udvartan (Dry Massage)*
- ✓ *Snana (Bath)*
- ✓ *Chankramana (Walking)*
- ✓ *Exercise*
- ✓ *Yoga*
- ✓ *Vigorous activity*



2.9.3. YOGASANAS:

- Utthita Trikonasana
- Parivritta Trikonasana
- Prasarita Padottanasana
- Jathara Parivartanasana
- Pavanamuktasana
- Viparitakarani
- Bhujangasana
- Dhanurasana
- Mandukasana
- Ardha Matsyendrasana
- Paschimottanasana
- Ardha Ustrasana

RELAXATION WITH ABDOMINAL BREATHING

PRANAYAMA

- Nadishodhana/Anuloma Viloma Pranayama
- Bhramari Pranayama

KRIYAS:

- Agnisara Kriya (1 minute)
- Kapalabhati Kriya (1 minute practice @ 60 breaths per minute followed by rest of 1minute)

CYCLIC MEDITATION -AVARTANA DHYANA

2.9.4. Yoga for Type 2 DM Protocol

Yoga for T2DM: Protocol

(Total duration of 60 minutes: 30 minutes of physical activity; 30 minutes of pranayama + relaxation; to be practiced at least 5 days a week)

SNo	Name of the practice	Duration
1	Starting Prayer: Asatoma Sat Gamaya	2 mins
2	Preparatory Sukshma Vyayamas and Shithililarana Practices 1. Urdhvahastashvasan (<i>Hand Stretch Breathing 3 rounds at 90°, 135°, 180° each</i>) 2. Kati-Shakti Vikasaka (<i>3 rounds each</i>) a. Forward and Backward Bending b. Twisting 3. Sarvangapushhti (<i>3 rounds clockwise, 3 rounds anti-clockwise</i>)	6 mins
3	Surya Namaskara (SN) a. 10 step fast Suryanamaskara 6 rounds b. 12 step slow Suryanamaskara 1 round <i>(To be avoided by those with knee pain, cardiac problems, renal problem, low back pain, retinopathy and the elderly who are weak and not flexible; instead they can do Chair SN)</i> Modified version Chair SN: 7 rounds	9 mins
4	Asanas (<i>1 minute per asana</i>) 1. Standing (<i>1 minute per asana</i>) Trikonasana, Pravritta Trikonasana, Prasarita Padhastasana 2. Supine Jatarasana, Parivartanasana, Pavanamuktasana, Viparitakarani 3. Prone 3minute Bhujangasana, Dhaurasana followed by Pavanmuktasana 4. Sitting Mandukasana, Vakrasana / Ardhamatsyendrasana, Paschimatanasana, Ardha Ushtrasana At the end, relaxation with abdominal breathing in supine position (<i>vishnanti</i>), 10-15 rounds (<i>2 minutes</i>)	15 mins
5	Kriya a. Agnisara: 1 minute b. Kapalabhati (@ 60 breaths per minute for 1 minute followed by rest for 1 minute)	3 mins
6	Pranayama a. Nadishuddhi (<i>for 6 minutes, with antarkumbhaka and jalandhar bandha for 2 seconds</i>) b. Bhramari (<i>3 minutes</i>)	9 mins
7	Meditation (<i>For stress management for deep relaxation and silencing the mind</i>) Cyclic Meditation (<i>Those who are willing to practice techniques of relaxation evolved by their own institutes may do so</i>)	15 mins
8	Resolve	1 min
9	Closing Prayer: Sarvebhavantu Sukhinaha...	1 min
	Total	60 mins

Note: this is an exhaustive list that could be given to all prediabetics and fit diabetics who can perform the practices. But it is clear that AYUSH therapies are all individualized hence caution is to be exercised while selecting [from this list] for the individual case considering their age, gender, severity of the illness, capacity, presence or absence of complications and the status of dosha.

2.10 Secondary prevention- Halts the progress of the disease at its incipient stage.

- **The target is to prevent further meda, kleda and kapha dushti;**
- Prameha nidana parivarjana -Dinacharya, Ahara, vyayama and Yoga Protocol;
- Nisha-Amalaki, Triphala, Yava dominant diet, Musta.
- Low glycemic index food.
- Do “**Ritu Anusara Shodhana**”

2.11 Tertiary prevention- to prevent and control Target Organ damage.

- **The target is to prevent further meda, kleda and kapha dushti**
- Prameha nidana parivarjana -Dinacharya, Ahara, vyayama and Yoga Protocol; Medicinal recommendations, low glycemic index food Therapeutic nutrition (Ahara based on Ahara vidhi Vdhana)
- Do “**Shodhana**”
- **Rasayana Sevana**³²
- Rehabilitation at psychological (Satvavajaya), vocational, & medical components(Aushadha)

³² दीर्घमायुः स्मृतिं मेधामारोग्यं तरुणं वयः | प्रभावर्णस्वरौदार्थं देहेन्द्रियबलं परम् | ७ ||
वाक्षिसद्दिं प्रणतिं कान्ति लभते ना रसायनात् | लाभोपायो हि शस्तानां रसादीनां रसायनम् | ८ || Cha.chi 1/7-8)

3. STANDARD TREATMENT GUIDELINES

General Diagnostic criteria

- **Increased frequency of urine**
- **Turbidity in urine**
- **Excessive thirst & hunger**
- **Lethargy**
- **FBS >125 mg/dl and (or) PPBS >200 mg/dl³³ Plus**
- **Any 5 or more of the following symptoms:**
- Like cool surroundings (Subjective)
- Sweetness in mouth (Subjective)-
- Burning / Numbness - Palms & Soles (Subjective)
- Ants noted in the toilet - (Subjective)

Sthoola Pramehi –

General Diagnostic criteria + BMI > 25 + adiposity

Krishapramehi –

General Diagnostic criteria + BMI < 18 + adiposity

Kapha Pramehi

General Diagnostic criteria + BMI > 25 Plus some of the following features

- Recent onset of Diabetes (<2 years)
- (Use of excessive sweets, high calorie diet)
- Bulk eating habit
- Indigestion predominant Upper GIT symptoms and recurrent URT symptoms

Pitta Pramehi

General Diagnostic criteria + BMI >18 , <25 Plus some of the following features

- Medium onset of Diabetes (2-6years)
- Use of spicy salty diet
- Bulk eating habit
- Acidity predominant Upper GIT symptoms and Recurrent UTI

Vata Pramehi

General Diagnostic criteria + BMI <18 Plus some of the following features

³³Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia, Report of a WHO/IDF Consultation, 2006. http://apps.who.int/iris/bitstream/10665/43588/1/9241594934_eng.pdf (Assessed on 20.10.2016)

- Chronic onset of Diabetes (>6years)
- Use of dry low nutritional diet
- Less eating habit

Level 1: at solo Ayurveda physician clinic

Clinical Diagnosis: - On the basis of history and clinical presentation patient can be diagnosed provisionally as with subtypes as Sthoola / Krisha and doshic variety Kapha/ pitta/ vata.

Patients diagnosed as sthoola / kapha / Pitta and having at least moderate physical strength and blood sugar level as follows may be treated at this level.

FBS >110 upto 180

PPBS > 200 upto 280

Investigation:

Blood-sugar level

Urine- sugar

Treatment: in the initial stage when the patient is having mild raised blood sugar levels and not associated with major complications, along with diet restriction, two or more of following drugs may be given:

Drugs	Dosage form	Dose	Time of administration	Dosha Specification	Anupana
<i>Vijayasaradi Kvatha</i>	Decoction	10-15 ml	Before meal/twice daily	Kapha / Pitta	-
<i>Phalatrikadi Kvatha</i>	Decoction	10-15 ml	Before meal/twice daily	Kapha / Pitta	-
<i>Kathakakhadir adi Kashaya</i>	Decoction	10-15 ml	Before meal/twice daily	Kapha	-
<i>Nishakathakadi Kashaya</i>	Decoction	10-15 ml	Before meal/twice daily	Pitta	-
<i>Nisha-amalaki -Haridra powder</i>	Powder	6gm	After meal/twice daily	Irrespective of Dosha	With water
<i>Mamajjaka Ghana Vati</i>	Vati	2-3 tablet	before meal/thrice		With water

			daily		
<i>Saptargangyadi Vati</i>	<i>Vati</i>	2-3 tablet	before meal/thrice daily		With water
<i>Gokshuradi Guggulu</i>	<i>Vati</i>	2-3 tablet	before meal/thrice daily	<i>Paittika with UTI</i>	With water
<i>Triphala churna/Tablet</i>	<i>powder/t ab</i>	3- 6gm/ 2-3 tablet	before meal/thrice daily		With warm water

Standard treatment guidelines

Case Definition:

General Diagnostic criteria for

- **Increased frequency of urine**
- **Turbidity in urine**
- **Excessive thirst & hunger**
- **Lethargy**
- **FBS >125 mg/dl and (or) PPBS >200 Plus**
- **Any 5 or more of the following symptoms**
- Sweating (Subjective)
- Foul body odour - (Subjective)
- Looseness of body (Subjective)
- Tendency to rest (Subjective)
- Eye discharge / Ear Wax
- (Subjective)
- Heaviness of body (Subjective)
- Like cool surroundings (Subjective)
- Sweet taste feeling (Subjective)-
- Burning / Numbness - Palms & Soles (Subjective)
- Ants noted in the toilet - (Subjective)

Sthoola Pramehi –

General Diagnostic criteria + BMI > 25

Krishapramehi –

General Diagnostic criteria + BMI < 18

Kapha Pramehi

General Diagnostic criteria + BMI > 25 Plus some of the following features

- Medium onset of Diabetes (2 -6 years)
- Use of spicy salty diet
- Bulk eating habit
- Indigestion predominant Upper GIT symptoms and recurrent URT symptoms

Pitta Pramehi

General Diagnostic criteria + BMI >18 , <25 Plus some of the following features

- Recent onset of Diabetes (2-6years)
- Use of high calorie diet
- Bulk eating habit
- Acidity predominant Upper GIT symptoms and Recurrent UTI

Kapha Pramehi

General Diagnostic criteria + BMI <18 Plus some of the following features

- Chronic onset of Diabetes (>6years)
- Use of dry low nutritional diet
- Less eating habit

Level 1: at solo Ayurveda physician clinic

Clinical Diagnosis: - On the basis of history and clinical presentation patient can be diagnosed provisionally as with subtypes as Sthoola / Krisha and doshic variety Kapha/ pitta/ vata.

Patients diagnosed as sthoola / kapha / Pitta and having at least moderate physical strength and blood sugar level as follows may be treated at this level.

FBS >110 upto 180

PPBS > 200 upto 280

Investigation:

. Blood-sugar level

Urine- sugar

Treatment: in the initial stage when the patient is having mild raised blood sugar levels and not associated with major complications, along with diet restriction, two or more of following drugs may be given:

Drugs	Dosage form	Dose	Time of administration	Dosha Specification	Anupana
<i>Vijayasaradi Kvatha</i>	Decoction	10-15 ml	Before meal/twice daily	Kapha / Pitta	-
<i>Phalatrikadi Kvatha</i>	Decoction	10-15 ml	Before meal/twice daily	Kapha / Pitta	-
<i>Kathakakhadir adi Kashaya</i>	Decoction	10-15 ml	Before meal/twice daily	Kapha	-
<i>Nishakathakadi Kashaya</i>	Decoction	10-15 ml	Before meal/twice daily	Pitta	-
<i>Nisha-amalaki -Haridra powder</i>	Powder	6gm	After meal/twice daily	Irrespective of Dosha	With water
<i>Mamajaka Ghana Vati</i>	Vati	2-3 tablet	before meal/thrice daily		With water
<i>Saptargangyadi Vati</i>	Vati	2-3 tablet	before meal/thrice daily		With water
<i>Gokshuradi Guggulu</i>	Vati	2-3 tablet	before meal/thrice daily	Paittika with UTI	With water
<i>Triphala churna/Tablet</i>	powder/tablet	3-6gm/2-3 tablet	before meal/thrice daily		With warm water

Pathya-apathyta (Diet and life style education):

Do's (Pathya)

Use of Purana dhanya (grains harvested 1 year back), Bharjita Dhanya (roasted grains) – When the grains are roasted, carbohydrates in the grains are transformed into short chain pyrodextrines, which are easy to digest and have low glycemic index. Yava- (Barley) It has low glycemic index, high fiber content. Helps in controlling BSL levels and cholesterol. Provides satiety and minimizes hunger pangs. In the pulses, Mudga and Kulattha, Adhaki, Masura, Makushtha are recommended, Tikta Shaka: green leafy vegetables like fenugreek. Atasi (Flaxseed), sarshapa (mustard), are recommended.

Jangal mansa in roasted form: Flesh of animals living in dry geographical locations are good source of protein and Vitamin B12.

Chart Showing Various diet Useful in

Type of Diet	Name
Cereals	Yava (Barley) (<i>Hordeum vulgare</i>), godh£ma (wheat), kodrava (grain variety - <i>Paspulum scrobiculatum</i>) <i>uddjlaka</i> (according to <i>dhanvantari Nighantu</i> forest variety of <i>k°drava</i>), Kangu (<i>Seteria italica</i>), Madhulika (<i>Elusine coracana</i>), Shyamaka (<i>Echinochloea frumentacea</i>), Jurnahva (<i>Sorghum vulgare</i>), Vajranna (<i>Pennisatum typhoides</i>), <i>Purana shali</i> (old rice)..
Pulses	<i>Adhaki</i> (red gram- <i>Cajamus cajan</i>), <i>kulattha</i> (horse gram) and <i>mudga</i> (green gram), Masura (Lentils), Makushtha (Moth Bean/Acpnite bean), Chanaka (<i>Cicer arietinum</i>) should be taken with bitter and astringent leafy vegetables.
Vegetables	<i>Navapatola</i> (young <i>Tricosanthus dioica</i>), young vegetables variety of banana, <i>tanduleyaka</i> (<i>Amaranthus spinosus</i>), <i>vastukam</i> (bathuva), all bitter vegetables (<i>tiktasakam</i>) like <i>methika</i> (Fenugreek leaves), <i>Karavellaka</i> (Bitter gourd), Bimbi (Kovai), Shigru fruits and leaves (Drum stick), Vrintaka (Brinjal), Rakta vrintaka (Tomato), Putiha (mint leaves), Suran (<i>amorphophellus</i>), Curry leaves, Mulaka (radish), Kushmanda (Ash Gourd), Kritavedhana (Ridge gourd), Alabu (Bottle gourd),
Fruits	<i>Jambu</i> (<i>Syzygium cumini</i>) <i>kapitha</i> (<i>Feronia limonia</i>), <i>amlaki</i> (<i>Phyllanthus embilica</i>), Bilva (Bael), Dadima (Pomegranate), Naranga (Orange), Parushaka (<i>Falsa Gravia asiatica</i>), Udumbara (fig) etc fruits.
Flesh	birds like kapota (pigeon), Titira (Grey Francolin)
Oils	<i>Atasi</i> (<i>Linum usitatisimum</i>), <i>saràapa</i> (mustard).
Condiments	Haridra (Turmeric), Maricha (Pepper), Tvak (Cinnamon), Lashuna (Garlic), Shunthi (Ginger), Methika (Fenugreek), Dhanyaka (Coriander), Jeeraka (cumin seeds)

Vihara (Life style):

Ayurvedic texts suggest Long walks, swimming, hard labor like pulling carts, digging wells, serving animals etc. All this involves muscular activity, which will help in maintaining muscle tone and peripheral utilization of glucose.

Today, weight training exercises can be done. Following norms should be followed before or after exercise:

- Exercise should be initiated at low intensity and should be gradually increased
- It should not be done after eating heavy meals.
- It should be done regularly at fixed timings.
- Before exercise, a person should have taken proper sleep, his diet should have been digested properly.

Don'ts (Apathya): Ahara

Excessive use of Sweets, fruit salad, Sugar cane, Fruits like Mango, Water melon, Chikoo, Dates, Jack fruits, Custard apple, Banana, Grapes, Cashew nuts, and other fruits with high glycemic index, use of cold drinks, intake of oil, Ghee, fried food, Over indulgence of meat especially of wet land animals, To take food before complete digestion of past food, To take food in improper time and in varied quantity.

Vihara

Day time sleep especially just after taking heavy meal; Irregular pattern of sleep i.e less than 5 hours or more than 10 hours in a day or in improper way; No or less or infrequent exercise

Referral criteria: Patient not responding to above mentioned management in terms of symptomatology and reduction in blood sugar levels and developing signs of complication of Diabetes may be referred to next level

Level 2: Ayurvedic hospital with indoor facilities:

All patients referred from level 1 and those patients diagnosed as Krisha parmehi / Vata / Durbala / Pitta with medodushti may be treated at this level

Clinical diagnosis:

Same as level 1 for a fresh case reporting directly.

Investigation: - same as level 1; in addition

1. Hb A1C
2. Lipid profile

Treatment:-

In addition to the management mentioned in Level 1, few of the following drugs may be added as per the requirement and status of the patient. *Rasaushadhi* (Herbo-mineral drugs) or herbal drugs of potential pharmacovigilance importance can be used at this level. Patient may be kept under observation while prescribing these kinds of medicines.

Drugs	Dosage form	Dose	Time of administration	Specific indications	Anupana
<i>Shiva Gutika</i>	Vati	1-2 tablet	Before meal/twice daily	Diabetic Impotence, Neuropathy	-
<i>Vanga Bhasma</i>	powder	125-250mg	after meal/twice daily		Water
<i>Trivanga Bhasma</i>	Powder	125-250mg	after meal/twice daily		Water
<i>Vasantkusum akara Rasa</i>	Powder	125-250mg	after meal/twice daily	Diabetic peripheral neuropathy	Water
<i>Arogyvardhini Vati</i>	Vati	1-2 tablet	before meal/thrice daily		With water
<i>Chandraprabha Vati</i>	Vati	2-3 tablet	before meal/thrice daily	Diabetic nephropathy	With water

Pathya-apathyta (Diet and life style education): same as level 1

Referral criteria: Patients' blood sugar not well under control and having associated conditions like Macrovascular complications like Ischemic heart disease, microvascular complications like diabetic kidney disease, retinopathy, neuropathy etc may be referred to the next level.

Level 3: Hospitals with indoor facilities like Panchakarma, Ksharasutra etc. and have integrative facilities

All patients referred from level 2 should be treated at this level

All patients willing to undergo Shodhana line of management for better recovery in Sthoola Balavan / Kapha / Pitta pramehi also should be treated at this level.

All patients of Krisha pramehi / Vata / Durbala patients should be treated at this level

Patients having HbA1c above 9 should be treated at this level.

Clinical Diagnosis: Same as level 1 for a fresh case reporting directly

Investigation:-

1. Serum electrolytes
2. Blood urea and serum creatinine

3. Urine for Micro albumin
4. ECG
5. Fundus examination

Treatment:

In addition to the management of Level 1 and Level -2, if needed Panchakarma procedures can be performed.

- *Udavartana* with Yavakolakulatha churna, *Triphala* Powder or *Yava* powder
- *Snehapana* with Sarshapa taila, Dhanwantara ghrita, Kalyanalkmghrita
- *Vamana Karma* with *Madanaphala Churna* (5-10gm), *Pippali Churna* (1-2gm), *Vacha Churna* (2-3gm), Rock salt(5-6gm), honey(Q.S), for *Vamanopaga- Nimba Kashaya*.
- *Virechana* – With *Brihat triphala churna*, *Mishraka sneha*,
- *Asthapana Basti* prepared with decoction Surasadigana or nygrodhadigana.

Patient with *Apatarpana Janya* presentation (Vata predominance)

1. *Yapana Basti/Madhutailika Basti* with *Erandmoola* Decoction, *Shatapushpa* Paste Honey and oil in equal quantity, rock salt.
2. *Anuvasanavasti* with *Dhanwantahra ghrita*, *Dhanwntahara taila*, *Guggulithiktaka ghrita*
3. *Shirodhara*
4. *Sarvanga taila / Kseeradhara*

Pathya-apathyā (Diet and life style education): same as level 1

Here modifications in diet and exercise should be made as per the strength and built of the patient is concerned. Moderately nourishing article which do not aggravate kapha and medus can be advised

Compatibility of Ayurvedic treatment with Allopathic concurrent treatment

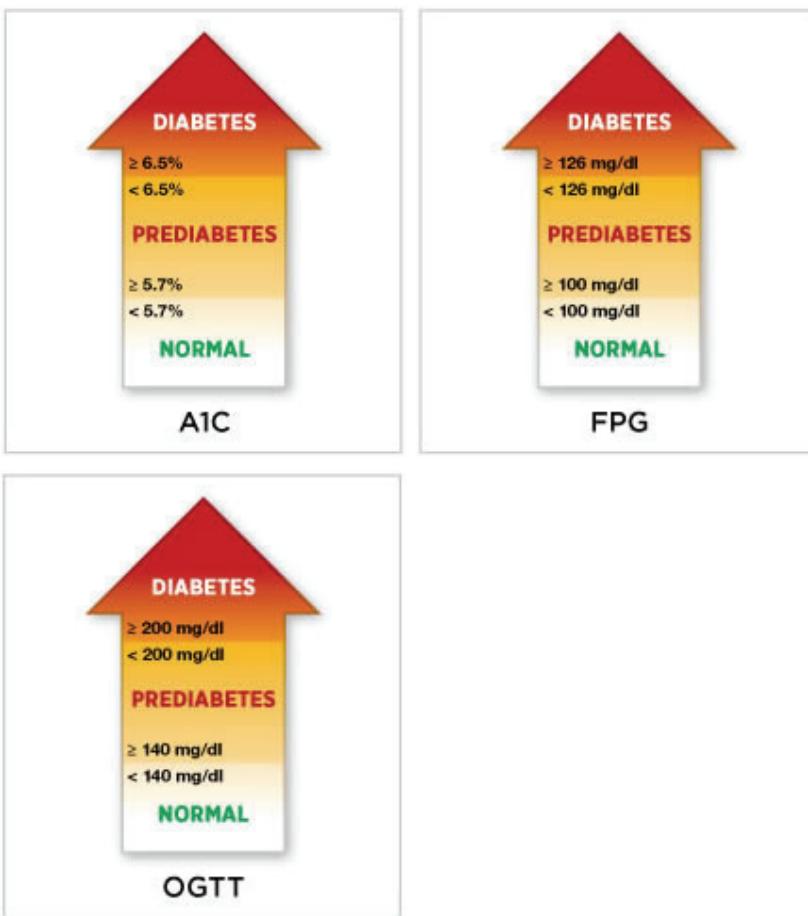
Many a times, diabetic patient, who comes for Ayurvedic treatment is already on allopathic oral hypoglycaemic agents, antihypertensives, blood thinners and lipid lowering agents. Systematic study on Ayurvedic and Allopathic drug interactions is not known to be carried out so far. In one study on use of kakamachi in Diabetes, it was found that, the group which received metformin and kakamachi together showed comparatively less reduction in BSL levels than the other group, which received metformin

alone. So, it is better to keep separate *aushadhi sevan kaala* for allopathic and Ayurvedic drugs.

4. Threshold for diabetes diagnosis

There are several ways to diagnose diabetes. Each way usually needs to be repeated on a second day to diagnose diabetes.

Testing should be carried out in a health care setting (such as your doctor's office or a lab). If your doctor determines that your blood glucose level is very high, or if you have classic symptoms of high blood glucose in addition to one positive test, your doctor may not require a second test to diagnose diabetes.



A1C

The A1C test measures your average blood glucose for the past 2 to 3 months. The advantages of being diagnosed this way are that you don't have to fast or drink anything.

- Diabetes is diagnosed at an A1C of greater than or equal to 6.5%

Result	A1C
Normal	less than 5.7%
Predabetes	5.7% to 6.4%
Diabetes	6.5% or higher

Fasting Plasma Glucose (FPG)

This test checks your fasting blood glucose levels. Fasting means, after not having anything to eat or drink (except water) for at least 8 hours before the test. This test is usually done first thing in the morning, before breakfast.

- Diabetes is diagnosed at fasting blood glucose of greater than or equal to 126 mg/dl

Result	Fasting Plasma Glucose (FPG)
Normal	less than 100 mg/dl
Predabetes	100 mg/dl to 125 mg/dl
Diabetes	126 mg/dl or higher

Oral Glucose Tolerance Test (also called the OGTT)

The OGTT is a two-hour test that checks your blood glucose levels before and 2 hours after you drink a special sweet drink. It tells the doctor how your body processes glucose.

- Diabetes is diagnosed at 2 hour blood glucose of greater than or equal to 200 mg/dl

Result	Oral Glucose Tolerance Test (OGTT)
Normal	less than 140 mg/dl

Prediabetes	140 mg/dl to 199 mg/dl
Diabetes	200 mg/dl or higher

Random (also called Casual) Plasma Glucose Test

This test is a blood check at any time of the day when you have severe diabetes symptoms.

- Diabetes is diagnosed at blood glucose of greater than or equal to 200 mg/dl

What is Prediabetes?

Before people develop type 2 diabetes, they almost always have "prediabetes" — blood glucose levels that are higher than normal but not yet high enough to be diagnosed as diabetes.

Doctors sometimes refer to prediabetes as impaired glucose tolerance (IGT) or impaired fasting glucose (IFG), depending on what test was used when it was detected. This condition puts you at a higher risk for developing type 2 diabetes and cardiovascular disease.

No Clear Symptoms

There are no clear symptoms of prediabetes, so, you may have it and not know it.

Some people with prediabetes may have some of the [symptoms of diabetes](#) or even [problems from diabetes](#) already. You usually find out that you have prediabetes when being tested for diabetes.

If you have prediabetes, you should be checked for type 2 diabetes every one to two years.

Results indicating prediabetes are:

- An A1C of 5.7% – 6.4%
- Fasting blood glucose of 100 – 125 mg/dl
- An OGTT 2 hour blood glucose of 140 mg/dl – 199 mg/dl

Preventing Type 2 Diabetes

You will not develop type 2 diabetes automatically if you have prediabetes. For some people with prediabetes, early treatment can actually return blood glucose levels to the normal range.

Research shows that you can lower your risk for type 2 diabetes by 58% by:

- Losing 7% of your **body weight** (or 15 pounds if you weigh 200 pounds)
- **Exercising moderately** (such as brisk walking) 30 minutes a day, five days a week

Don't worry if you can't get to your **ideal body weight**. Losing even 10 to 15 pounds can make a huge difference.

iii) Screening for risk factors

Several risk factors have been associated with **type 2 diabetes** and include:

- Family history of diabetes
- Overweight
- Unhealthy diet
- Physical inactivity
- Increasing age
- High blood pressure
- Ethnicity
- Impaired glucose tolerance (IGT)*
- History of gestational diabetes
- Poor nutrition during pregnancy

Impaired glucose tolerance (IGT) is a category of higher than normal blood glucose, but below the threshold for diagnosing diabetes.

Changes in diet and physical activity related to rapid development and urbanisation have led to sharp increases in the numbers of people developing diabetes.

Pregnant women who are overweight, have been diagnosed with IGT, or have a family history of diabetes are all at increased risk of developing **gestational diabetes mellitus (GDM)**. In addition, having been previously diagnosed with gestational diabetes or being of certain ethnic groups puts women at increased risk of developing GDM.

5. Glycemic Targets

TARGETS OF CONTROL IN THE MANAGEMENT OF DIABETES³⁴

Fasting blood glucose	80-120 mg/dl
Post meal blood glucose	<160 mg/dl
HbA1C	<7%

Note: After 40 years, blood sugar should be checked regularly. If a person is overweight, the blood sugar level should be checked even before the age of 40 years.

³⁴ Guidelines for Medical Officers, Prevention and Management of Cardiovascular diseases, Diabetes and Stroke, Center for Chronic Disease Control, Public Health Foundation of India, Developed for NPCDCS Programme under GOI-WHO collaborative programme (2008-09), Prevention and Management of Diabetes, page no. 44, August, 2009.

6. Glossary

Abaddha Meda	Meda which is unbound, dyslipedemia
Agni	digestive fire
Agnivaiśamya	imbalance of digestive fire
Āhāra	Any substance which is masticated and swallowed for the purpose of nutrition and energy, it includes all eatables, biteable, drinkable and lickables.
Āhāra -pariṇāma-bhāva-viśeṣah	a factor for transformation of the food
Alālameha	A type of Prameha
Alasya	Laziness, Loss of enthusiasm
Alpa Maithūna	Sexual dysfunction
Alpa Prāṇa	Decreased work capacity
Amashaya	Stomach
Ambu	Water, fluid
Anilātmaka	Vāta in nature
Añjana	corrylium, eye ointment
Anna -śaithilya-pādanam tasya karma	its function is to soften the food
Anushangiroga	Chronic disease, Recurrent, relapsing disease
Apatarpaṇajanya	Borne out of malnourishment, undernutrition
Apathya	Inappropriate diet and lifestyle measures
Apathyanimittaja	Borne out of apathy. (see pathya)
Ārdratā	Moistness
Ārdratvam	wetness
Asādhya	incurable, difficult to manage
Ashukari	Acute, quickly becoming severe
Asyamadhura	Sweet taste in the mouth
Atinidrā	Excessive sleep
Āvaraṇa	Obstruction to the path of Vata
Avastha	Condition, stage
Avilatva	Turbidity
Bahu	Abundant
Bahudrava	abundant liquid
Basti	Bladder, A type of Medicated enema
Bheda	Types, Advanced condition
Bījāvayava	components of bija (Genes)
Chala Sphik - Udara – Stana	pendulous hips, abdomen and breasts
Dantadinam maladhyatvam	Slimy mucous deposit on tongue, palate, pharynx and teeth

<i>Daurbalya</i>	Weakness
<i>Daurgandhya</i>	Bad Odour From Body
<i>Deha-chikkannta</i>	feeling of stickiness in the body
<i>Dhātuapakarṣaṇajanya</i>	borne out of depletion of dhatu (tissues)
<i>Dhātūḥ</i>	Tissue
<i>Dhatukshaya</i>	depletion of tissue
<i>Dinacharya</i>	Daily regimen
<i>Diwaswap</i>	sleeping in the daytime/afternoon
<i>Doṣa</i>	Vata, Pitta and kapha; Principal constituents of the body that are responsible for homeostasis
<i>Drava atisevana</i>	excessive partaking of liquids
<i>Dravadravya</i>	liquid substances
<i>Durgandhascha Shwasaha</i>	Bad smell in the breath
<i>Dushya</i>	Those bosy elements which are sucetible to be vitiated by dosas
<i>Gala-talu-shosha</i>	Dryness of throat and palate
<i>Gambhira</i>	Deep
<i>Gaurava</i>	Heaviness
<i>Ghanangta</i>	Corpulence of the body /Feeling of heaviness
<i>Gorasa Varga</i>	Dairy Products
<i>Gramyaudakanuparasa</i>	meat soup of the domestic, aquatic and marshy animals
<i>Guru</i>	Heavy
<i>Gurugatrata</i>	Heavyness of the body
<i>Haridrāmeha</i>	A type of prameha where there is yellow coloured urination
<i>Hastimeha</i>	A type of prameha
<i>Hrid-netra-jihva-shravanaupadeha</i>	Feeling Sliminess in precordial region, eyes, tongue and ears.)
<i>Ikshuvikara</i>	Jaggery and its preparations
<i>Ikśubālikāmeha</i>	A type of prameha
<i>Iksumeha</i>	A type of prameha, glycosuria
<i>Jalam</i>	Water, fluid
<i>Janya</i>	Borne out of
<i>JatahaPramehi</i>	Patient of diabetes of hereditary origin
<i>Jatilibhavam kesheshu</i>	Matting of hairs
<i>Kälameha</i>	A type of prameha with black coloured urination
<i>Kaphaja</i>	Kapha in nature
<i>Kaphajameha</i>	A type of Kaphaja prameha
<i>KaphapittaKshaya</i>	depletion of Kapha and Pitta

<i>KaphaPittaPramehi</i>	Prameha of Kapha and Pitta type
<i>Kaphasambhava</i>	Borne out of Kapha dominance
<i>Kara-pada daha</i>	Burning sensation of palms and soles
<i>Kara-pada suptata</i>	Numbness in hands and feet
<i>Karshya</i>	asthenic, lean, thin
<i>Kaśāya</i>	Astringent
<i>Kaya-chhidreshu upadeha</i>	Searing in body orifices
<i>Kaye malam</i>	Accumulation of waste products/exudates in various body parts
<i>Kesha-nakha ativriddhi</i>	Excessive growth of hairs and nails
<i>Kleda</i>	—śarīrastham jalam, dravadravya višeṣo vā, [the water element situated in the body (moisture), or a description of liquid substances ; āhāra-parināma-bhāva-višeṣah (a factor for transformation of the food); anna-śaithilya-pādanam tasya karma (its function is to soften the food) – śonitādi-vikārah— (malārdratvam) – a disease of the dhātus beginning with rakta, the malas becoming increasingly wet; a pathological syndrome in the body characterized by wetness or phlegm like consistency –A synonym = ārdratvam – wetness
<i>Kleda vriddhi</i>	increased extracellular fluid level in the body
<i>Kledaka kapha</i>	a type of Kapha that causes moistening and loosening of food
<i>Krathana</i>	Sudden Obstructive Respiration
<i>Kriyākāla</i>	Stages of evolution of disease during which proper intervention can prevent the further progress of the disease. There are six Kriyākāla.
<i>Kśārameha</i>	a type of Pittaja prameha
<i>Kśaudra</i>	Honey
<i>Kśaudrameha</i>	urination like honey
<i>Kśīram</i>	Milk
<i>Kṣudraśvāsa</i>	Dyspnoea
<i>Kṣut</i>	Voracious Appetite
<i>Lakshanās</i>	Clinical features
<i>Langhana</i>	Fasting
<i>Lasikā</i>	Serum
<i>Lohitameha</i>	a type of Pittaja prameha
<i>Madhu</i>	Honey
<i>Madhumeha</i>	urination like honey, Diabetes Mellitus
<i>Madhura</i>	Sweet

Madhura Atisevana	excessive partaking of sweet
<i>Madhura mutrata</i>	Sweetness of urine
Madhusamam	like honey
<i>Madya Varga</i>	Liquors
Madya	Spirits
Mahāroga	major diseases
Mahāta	severe, large
Mahātyāyikatva	extreme tendency of landing into emergencies
Mahāvyāpatti	extreme tendency of landing into emergencies
Majjā	Marrow
Majjāmeha	a type of Prameha
Makaranda	Honey
Māksikam	Honey
Malādratvam	loosening of stools
<i>Māmsa Varga</i>	Flesh
Mañjiṣṭhāmeha	a type of Pittaja prameha where red colored urination occurs
Māmsadhātu	muscular tissue
Mārgāvaraṇa	Obstruction to the path of Vata
Meda	fatty tissue
Meda vilayana	liquefaction of fatty tissue
Medadushti	vitiation of Fat and Lipids
Medovahasrotas	the system and channels where metabolism of fat and lipids occurs
Meha	urination
Moha	Drowsiness
<i>Mukha shosha</i>	Dryness of mouth
Mutra Apravritti	Anuria
<i>Mutra Madhurya</i>	sweetness of urine
Mutraghata	Anuria
<i>Mutre mutra doshan</i>	Excretion of the abnormal constituents of the urine
Nidāna	Causes, Etiological factors
<i>Nidra sarvakalam</i>	Excessive sleep
Nīlameha	a type of pittaja prameha where blue coloured urination occurs
Ojomeha	a type of Vataja prameha where Ojas carrying urination occurs
Panchakarma	Penta Bio-purification measures
<i>Paridaha angeshu</i>	Burning sensation in body parts
<i>Pathya</i>	appropriate diet and lifestyle measures

<i>Phala Varga</i>	Fruits
Picchila	Slimy, viscous
Pidaka	carbuncles
<i>Pipasa</i>	Polydypsia
Pitta	one of the three dosa, responsible for digestion and metabolism in the body
Pittaja	borne out of Pitta Dominance
Poorvaroopa	pre-monitory symptoms
Prabhāva	Special effect
Prabhatatva	abundance
Prakopa	Vitiation
Prameha	Diabetes
Prasara	Spread
Prashna Pariksha	interrogation
Puṣpameha	a type of Prameha
Puṣparasa	Honey
Rakta pradoshakara nidana	the causative factors which vitiate rakta (blood)
Raktadhatu	Blood element
Rasa	Nourishment, liquid
Rasadhatu	First tissue element which provides nourishment to the body
Rasāyana	The term Rasayana comprises of two words,I,e Rasa and Ayana, Rasa signifies either Rasa Rakthadi Dhatus(tissues) of the body, Ayana convey the sense of Apyayana, which suggest a measure or methodology to saturate or enrich or conduct a special benefit to the body .Based on these principle, it has been said that one which capacity to enrich the Sapthadhatu of the body or the drugs possessing the qualities to saturate or replenish the Dhatu(tissues). Precisely stated as drug or food which has capacity to prevent ageing, improves longevity, provide immunity against the diseases, promote mental competence, increase vitality and luster of the body.
Ritucharya	Seasonal regimen
Roopavastha	Manifestation stage of a disease
Rukṣa	dry, rough
Saaraktittavibhajana	segregation of food into nourishing part and excreta
<i>Sada</i>	Fatigue
Sādhya	Curable, Easily manageable

<i>Sadhyasadhyata</i>	The assessment of the prognosis of a disease
<i>Sahaja</i>	Congenital
<i>śaithilya</i>	Flaccidity
<i>Samakriyatvat</i>	Procedures which are similar in nature
<i>samprapti</i>	Pathophysiology
<i>Śanairmeha</i>	a type of prameha where the frequency of micturition is increased
<i>Sanchaya</i>	the first stage of Kriyakala where accumulation of dosa occurs.
<i>Sāndrameha</i>	a type of prameha where the urine is dense
<i>Sāndraprasādameha</i>	a type of prameha where the urine is dense
<i>Sanshodhan</i>	Biopurification
<i>Santarpan</i>	Hypernourishment
<i>Sārabhooṭa</i>	extract
<i>Sāratara</i>	extract
<i>Śaka Varga</i>	Tubers
<i>Śami Dhanya</i>	Pulses
<i>Śatpada-pipilikabhisṭha</i>	Attraction /crawling of insects and ants to the body and urine
<i>Śarira-mutrabhisaranam</i>	
<i>Śayyasana-swapna</i>	<i>sukhe</i> Desire to sit and sleep
<i>Ratishcha</i>	
<i>Śighrakari</i>	quickly progressing
<i>Śitapriyatavam</i>	desire for cold things
<i>Śithilangata</i>	Flabbiness/laxity of the body
<i>Śleshma</i>	Kapha
<i>Śleshma viruddha Upakrama</i>	procedures which are opposite to kapha, treatment of kapha
<i>Śuka Dhanya</i>	Cereals
<i>Śukla mutrata</i>	Turbid/ white urine
<i>Śukra</i>	Genetic matter, semen
<i>Shvasa</i>	breathlessness
<i>Siktameha</i>	a type of prameha where there is a tendency of urolithiasis
<i>Śīta</i>	Cold
<i>Śītameha</i>	a type of prameha where the urine is cold
<i>Ślakṣṇa</i>	smooth
<i>Snigdha-pichchhila-guru</i>	Oiliness,sliminess and heaviness of the body
<i>Gatrata</i>	

Sthanasantshraya	Fourth stage of kriyakala where there is an interaction between dosa and dusya and resultant localization
<i>SthulaPramehi</i>	Fat or obese diabetic
Śuklameha	a type of prameha where the urine is of white colour
<i>Suptata angeshu</i>	Numbness in the body parts
Svapna	Sleepiness
Sveda	Sweat, perspiration
Swasthavritta	Preventive & promotive health domain of Ayurveda
Sveda Adhikya	Excessive Sweating
<i>Tandra sarvakalam</i>	Drowsiness /somnolence
Trṣā/Pipasa	Thirst
Udaka	water, liquid
Udakameha	a type of prameha where the urine is watry, diabetes insipidus
Udwartana	Massage with dry powders
Upadrava	complications
Upavasa	Fasting
Ushna	Hot
Uttarottara	Gradual progress
Vasāmeha	a type of prameha where the urine contains fatty material.
Vāta	A type of dosa, responsible for all the movements in the body
Vihāra	Behaviour and conduct
Virudhopakrama	the procedures which are opposite in nature
<i>Visra shariragandham</i>	Odour of raw flesh/meat in the body
Vyakti	Manifestation, Fifth stage of kriyakala
Vyayama	Exercise
Yāpya	a disease which can be controlled but cannot be entirely cured.

Appendix 1

7.1 Madhumeha is equated with all the Prameha

Commenting on the sutra: “सप्तपिडकामाधुमेहिकाः |” (Ca.Su. 17/7), Cakrapṇidatta states that the term Madhumeha is generally equated with the term Prameha (माधुमेहिकाइत्यत्रमधुमेहशब्दःसामान्येनप्रमेहवचनः) and cites references from caraka ci. 6 where caraka has used the term Prameha instead of Madhumeha while referring to the pidika described in Rogadhikara. (“प्रमेहिणांयाःपिडकामयोक्तारोगाधिकारे पृथगेव सप्त” (चि.६))

Cakrapṇidatta further cites Ca. Indiriya 9, where caraka used the term Madumehi while describing the Arishtha and states that Gulmi, Madhumehi and Rajyakshmi are untreatable because of their Bala and Mamsa parikshaya. (“गुल्मीचमधुमेहीचराजयक्षमीचयोनरः | अचिकित्स्याभवन्त्येतेबलमांसपरिक्षये” (इ.९)) Cakrapṇidatta brings forth the fact that Vatika Madhumeha by its own innate nature is untreatable and thev phrase “Bala and Mamsa parikshaya” is redundant

(अत्रहियदिवातिकोमधुमेहोऽभिप्रेतःस्यात्तदातस्यस्वरूपतएवासाध्यत्वेन

‘बलमांसपरिक्षयेसति’इतिविशेषणमनर्थकंस्यात् |). The phrase “Asadhyā because of Bala and Mamsa parikshaya” becomes relevant only when the term Madhumeha is interpreted with the broader connotation of Prameha. Cakrapṇidatta also cites Susruta Nidana 6 where susruta has enumerated the pidika and used the term “prameha” pidika instead of Madhumeha pidika

(सुश्रुतेनापिचसामान्येनप्रमेहे एवैताःपिडकादर्शिताः,

यदुक्तं-

“तत्रवसामेदोभ्यामभिपन्नशरीरस्यत्रिभिर्दौषेश्चानुगतधातोःप्रमेहिणोदशपिडकाजायन्ते”

(सु.नि.६)इत्यादि). Cakrapṇidatta also cites caraka nidana 4 where caraka has pointed to the evidence of ants being attracted to the sweet body of a prameha patient (“षट्पदपिष्पीलिकाभिश्चशरीरमूत्राभिसरणम्” (नि.४)इति) and to Vagbhata Nidana 10, where the sweetness of the entire body of a patient is mentioned and the term Madhumeha is used for all prameha

(मधुरंयच्चसर्वेषुप्रायोमधिवमेहति | सर्वेहिमधुमेहाख्यामाधुर्याच्यतनोरतः” (वा.नि.१०)इति).

Commenting on the sutra: जातःप्रमेहीमधुमेहिनोवानसाध्यउक्तःसहितीजदोषात् | (Ca.ci. 6/57), Cakrapṇidatta emphasises that the term Madhumeha also means all meha and bolsters his statement by commenting that if only vatika jata meha is considered asadhyā then other jata mehas will not be asadhyā, which is wrong. He also states that the term Prameha also implies

Madhumeha. He further cites “सप्तपिङ्कामाधुमेहिकाः |” (Ca.Su. 17/7) to reiterate that the term Madhumeha means all prameha including the distinct disease entity of Madhumeha

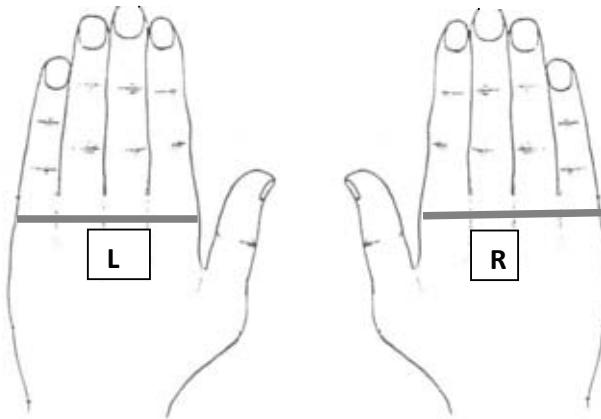
(तस्मान्मधुमेहशब्दः सर्वप्रमेहेमधुमेहविशेषचर्तते).

Some of the other references where Cakrapani equates the term Madhumeha with Prameha are:

- मधुमेहशब्देन सर्वप्रमेहग्रहणम् ... (cakrapani on ca.ci 6./14)
- मधुमेहशब्देन सर्वएवं मेहागृह्यन्ते,
मधुमेहशब्दो हि सर्वेष्वेव मेहेषु वर्तते इति कियन्तः शिरसीयेदर्शनीयं, (cakrapani on ca.su 14/16)
- मधुमेहशब्देन प्रमेहाएवोच्यन्ते;
....मधुमेहशब्दश्चयथा प्रमोहमात्र एव वर्तते तत्प्रतिपादितमेव प्रमेहचिकित्सिते (cakrapani on ca.ka 10/5)

7.2 Assess your Diabetes risk through Ayurveda.....!

Scores are indicated for each variable. Give the score and calculate the total score in the end.

A] Take your own body measurements. (For people above age 20 years)**1. Swanguli:**

Average breadth of fingers at knuckle level, measured with a measuring tape (as shown in above diagram)

$$\mathbf{L \text{ (cm)} + R \text{ (cm)}}$$

$$\frac{\mathbf{L \text{ (cm)} + R \text{ (cm)}}}{\mathbf{8}} = \dots \text{cm.} = \mathbf{1 \text{ anguli /swanguli}}$$

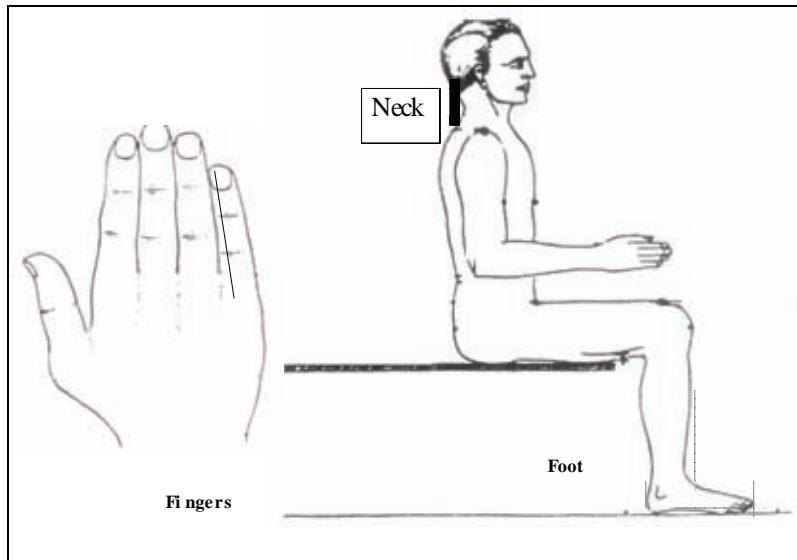
That is 1 anguli unit for you to measure your own body parts.

* you can also measure swanguli as average breadth of left and right middle finger, when measured at the level of proximal interphalangeal joint.

2. Measure your height on a height scale and other body parts with measuring tape. Obtain the measurements in centimeters. Divide the

obtained measurements by your swanguli to get your own anguli measurements.

Eg. If your 1 anguli/swanguli is 2 cms and height is 160 cms, Then, 160 cm divided by 2 cms ($160/2$) is equal to 80 angulis, which is your height in angulis. Compare this with the standard reference value.



3. Give your score in the rightmost column, as per score index.

Body Part	Measurement in cms	Measurement in angulis	Reference Anguli values	Score Index	Your Score
Height			84	Above 80 score 0. 75-80, score 1. Less than 75, score 2.	
Neck Length			4	More than or equal to 4, score 0.	

				3-4, score 1. 2-2.9, score 2	
Neck (maximum circumference)			22	Less than 22, score 0. 22-23, score 1. 23.1 and above, score 2.	
Ear length(Left)			4	3-4, score 0. Less than 3, score 1.	
Little finger (knuckle to finger tip of left little finger)			3 ½	3 ½ and above, score 0. Less than 3 ½ , score 1.	
Foot length (Left)			14	12 and above, score 0. Less than 12, score 1.	

- Score 6-9: High risk
- Score below 3: low risk
- Score 3-6 : Intermediate risk

B] Know your body fat!

Tick the proper answer.

1. Lips: a. Thick b. Thin c. medium
2. Earlobe: a. Thick b. thin c. medium
3. Chin: a. Thick b. thin c. medium.....
4. Abdomen (Belly): a. Pendulous b. Flat c. medium.....
5. Hips: a. Pendulous b. Flat c. medium.....
6. Chest: a. Pendulous b. Flat c. medium.....

If answer is 'a', take score 2, if answer is 'c', take score 1, if answer is 'b', take score 0.

- Score 6-12: High risk
- Score below 3: low risk
- Score 3-6 : Intermediate risk

C] Hair growth on forearms:

a. Dense b. medium c. sparse

If answer is 'a' or 'c', take score 1, otherwise 0.

D] Coating/secretions in Mouth, Ear, Nose and Eyes

If answer is 'a', take score 2; if answer is 'b', take score 1; if answer is 'c', take score 0.

1. Teeth:

a. Coating/tartar/plaques b. carries/cavities c. None of these.....

2. Tongue:

a. Fully coated b. Half coated c. Mildly coated/ Clean.....

3. Gums:

a. Spongy/prominent gums, visible when you laugh b. blackish gums c. none of these.....

4. Ears:

a. Ear discharge/Repeated ear infections b. Wax impaction c. None of these...

5. Nose:

a. Recurrent cold b. Change of season c. None of these.....

6. Eyes:

a. Sticky secretions, when you get up from sleep b. Watering c. None of these.....

E] Do you have following symptoms in your Palms and soles?

If the answer is yes, take score 1, otherwise 0.

- Burning of palms and/or soles.....
- Warm palms and/or soles.....
- Cracks in palms and/or soles.....
- Scaling of palms and/or soles.....
- Sweating in palms and/or soles.....
- Feel like removing the foot wares or putting feet in cold water.....

D] Do you have following symptoms related to thirst?

If the answer is yes, take score 1, otherwise 0.

- Dryness in the mouth in a short while after drinking water.....
- You frequently drink water, because you feel thirsty.....
- You prefer to drink chilled water even in cold winter mornings.....

E] How frequently you have to cut your nails?

If answer is 'a', take score 2; if answer is 'b', take score 1; if answer is c, d or e take score 0.

- a. Once in a week b. Once in 10-15 days c. Once in three weeks d. Once in a month e. Once in more than a month.....

F] Queries about urination

If the answer is yes, take score 1, otherwise 0

- Do you often urinate more than six times a day?.....
- Do you often get up at night to urinate for more than once?.....
- Do you often get burning sensation while urinating?.....
- Do you often experience chills, while urinating?.....
- Do you often experience pain/burning/itching /redness in the urethra or external meatus?.....

H] Food frequency questionnaire for Prameha

Food item	More than twice a week Score 3	Once a week Score 2	Once in 2-3 weeks Score 1	Once in a month or more Score 0
*Newly harvested grains				
Sweets/sugarcane products				
Curd				
Refined flours				
Fats (ghee, butter, oil, cheese etc) IN EXCESS				
High calorie, fatty food cookies, burgers, pizzas				
Seafood				
Flesh of domestic animals pork,				

chicken				
Black gram (udad dal)soups, khichdi				
Predominantly Liquid or semisolid items				
Milk products like payasam, basundi, shrikhand, icecreams etc				
Freshly brewed wine				
Hot, spicy, pungent				
Sour , salty like salted nuts, chats etc				
Fried like chips, farsan, samosa, kachori				
Incompatible food like fruit + milk, hot gulabjamun + cold icecream, milk products with Farsan or nonveg diet etc.				
Stale food				

* As per traditional practices, after harvest, grains are to be stored for a year before use. If they are consumed immediately after harvest, they become a causative factor.

I] Style of eating

Eating style	More than twice a week, Score 3.	Once a week Score 2.	Once in 2-3 weeks Score 1	Once in a month or more Score 0
Excessive eating				
Frequent eating, without hunger				
Eating very less				
Eating low calorie food				
Excessive fasting				
Undercooked or food items				
Food totally free of fats				

J] Lifestyle related factors in Prameha

Lifestyle	More than twice a week Score 3	Once a week Score 2	Once in 2-3 weeks Score 1	Once in a month or more Score 0
Long hours of sitting (sedentary work)				
Daytime sleep				
No physical exercise				
No use of body scrubs				
No worries or mental exercise				
Working in hot environments				
Frequent outburst of short tempers				
Excessive indulgence in sex				
Excessive physical exercise				
Less sleep in the night				
Abnormal physical postures				
Anxiety, depression and mental trauma				
Excessive worries or mental stress				
Excessive body detoxification processes				

Calculate your total score and know your risk.

Score 0 – 58 ...Low Risk

Score 59 – 89.....Medium risk

Score 90 – 160.....High risk

On the occasion of First National Ayurveda day being celebrated on Dhanvantari Jayanti and National Seminar on “Prevention and control of Diabetes through Ayurveda” this protocol is being released as an effort to fulfil “Mission Madhumeha through Ayurveda” by Ministry of AYUSH. The gravity of the disease Diabetes i.e. Madhumeha was well understood by Ayurveda. The Ayurvedic principles and advice related to diet prescribed for prevention of Madhumeha in ancient texts has been found very scientific by the modern science of nutrition and diet. With the appropriate integration of Ayurveda in public health it is possible to control the incidence of diabetes and prevent its complications. The specific diet, lifestyle and exercise explained in the protocol could be useful for the end user to promote self health. The Madhumeha Assessment Tool (MAT) based on unique Ayurvedic philosophy has been developed for the first time for the self assessment of people with regard to the possibility of diabetes. The treatment part has been designed in implementable form at all the levels ranging from District Hospital to a Primary Health Centre. The protocol will not only be helpful for Ayurveda doctors but will also enlighten Allopathic diabetologists and practitioners.

Respiratory Rate, Heart Rate and Continuous Measurement of BP Using PPG

Nivedita Daimiwal, M. Sundhararajan and Revati Shriram

Abstract— Measurement of blood volumetric changes in human body by photoplethysmographic sensors is used in present study. Objective is to measured different parameters that are heart rate, respiratory rate, BP. PPG signal is acquired by PPG sensor, microcontroller and RS 232. The acquired PPG signal is displayed in MATLAB. Frequency domain analysis of PPG signal shows a two peaks first at around 0.25 to 0.35 Hz and second at around 1 to 1.5 Hz. FFT at 1Hz relates to 60 BPM and FFT at 0.25 Hz relates to 15 respiratory cycles per minute. For BP Measurement, the pulse height of PPG is proportional to the difference between the systolic and the diastolic pressure in the arteries. The standard blood pressure monitoring instrument is used to calculate correlation coefficient. The arterial blood pressure is calculated based on these coefficients. PPG signal is used to detect blood pressure pulsations in a finger and achieved an accuracy of (0.8 ± 7) mmHg and (0.9 ± 6) mmHg for systolic and diastolic pressure, respectively. The developed PPG based method can be used as a noninvasive alternative to the conventional occluding-cuff approaches for long-term and continuous monitoring of blood pressure, heart rate and respiratory rate.

Index Terms - Blood pressure, Heart rate, Photoplethysmography, Respiratory rate, Reflectance type PPG sensor

I. INTRODUCTION

The Photoplethysmography is the measurement of volume changes with each heartbeat is useful for the measurement various cardiovascular parameters like of heart rate , respiratory rate and blood pressure .

Detailed analysis of frequency spectrum of PPG signal shows a cardiac peak around 1Hz corresponding to 60 pulsations a minute and respiratory peak around 0.25 Hz corresponding to 15 inspiration/expiration cycles per minute. [1] Blood pressure is the pressure that the blood exerts on the walls of the vessel is the pressure in the arteries of the body. During the contraction of ventricles the blood expelled from the heart, blood pressure is generated and it is at its maximum in the arterial system.

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This is called the systolic blood pressure (SBP) during the period when the heart is contracting. When the heart is relaxing and the ventricles are refilling with the blood returning from the body, the Pressure in the arteries is very low is called the diastolic blood pressure. It is important to note that for a healthy individual the blood pressure is well maintained. Normal blood pressure is around 120/80 mm of Hg. [2]

The non invasive, cuffless and continuous measurement of BP can be done by photoplethysmography. Arterial blood pressure is estimated from PPG. The pulse height of PPG is proportional to the difference between the systolic and the diastolic pressure. The correlation coefficients calculated using sphygmomanometer; arterial blood pressure values can be calculated. [2]

The rest of this article is organized as follows. Section II details the sensor design and acquisition system. Section III we demonstrates the results and analysis of the system. In section IV we draw the conclusion.

II. METHODS

Photoplethysmography is an optical technique for measurement pulsatile blood flow. It consists of LED as source and detector as photocell. The amount of light absorbed will depend upon the blood density in the finger tip and remaining amount of light is transmitted or reflected is captured by the sensor. The Plethysmographic pulse obtained by the optical sensor is used for various cardiovascular parameter measurement.

The period of the PPG waveform consist of two phases. The rising edge is as called the anacrotic phase and is the systolic upstroke time. The catacrotic phase characterized by the diastole on falling edge. A dicrotic notch is on the catacrotic phase. Fig. 1 shows the dicrotic notch is due to the closing of the aortic valve and thus increases blood volume in the arteries.[3] The peak height is the difference between the maximum of a cardiac cycle and the previous minimum. This is the height of the pulsatile (AC) component of the PPG. It is proportional to the difference between the arterial systolic and diastolic pressures.

This technique of measuring the blood pressure is not self sufficient because the SBP and the DBP values cannot be calculated from the pulse height alone without knowing a baseline blood pressure. System required standard BP apparatus like sphygmomanometer to measure SBP or DBP to obtained useful information from the pulse height. Calibration requirements of this technique necessitate the need to consider the alternative approach of using sphygmomanometer. [3,4]

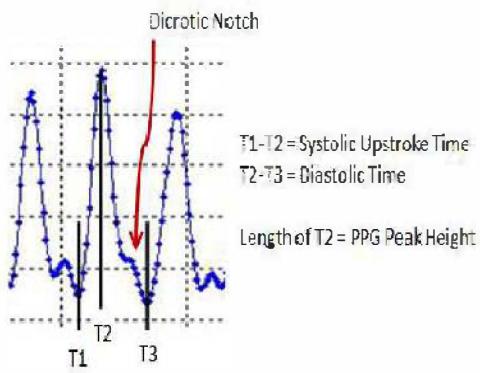


Fig. 1. PPG showing anacrotic and catacrotic phase, dicrotic notch and PPG Peak height.[3]

Fig. 2 demonstrates analysis of the frequency spectrum of the PPG signal shows the two principle frequency components namely – the cardiac peak at 1 Hz relating to 60 pulsations a minute (f_2) and the respiratory appearing at around 0.25 Hz relates to 15 respiration cycles per minute (f_1).[5]

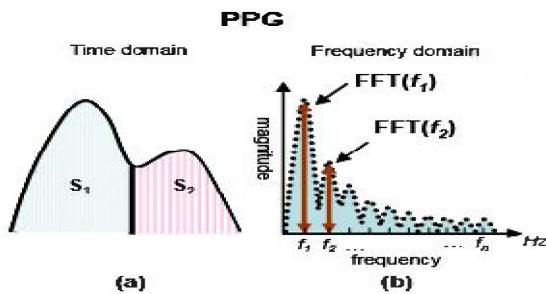


Fig. 2. Frequency spectrum of the PPG signal

A. PPG Sensor Design

The reflectance type sensor for capturing PPG signal from finger is designed as follows-

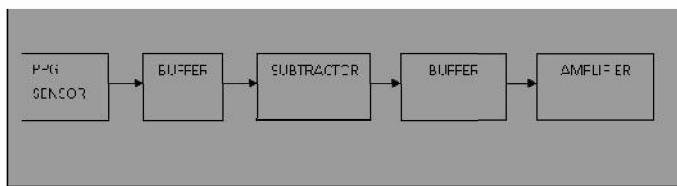


Fig.3. Signal conditioning circuit block diagram

Source: LED 660 nm Infrared Light Source.

Detector: Light Dependent Resistance (LDR)

Fig.3. demonstrates the optical signal is amplified by using Signal conditioning circuit. [6-7]

B. Real time Acquisition of PPG signal :

Real time acquisition of PPG signal is done in Matlab so as to identify the frequency contents within the signal and to measure heart rate and respiratory rate of person. Microcontroller 89C51 is used with external 8-bit (0809) analog to digital converter. In 0809 ADC, there is no self clocking and the clock must be provided from an external source to the clock pin. ADC programming is done in assembly language and its algorithm is given below-

- Port 2 is made as input port.
- Analog channel is selected by providing bits to A, B and C addresses. Here channel zero is selected.
- Address latch enable (ALE) pin is activated. It needs a low to high pulse to latch in the address.
- Start of conversion (SOC) is activated by a low to high pulse to initiate conversion.
- End of conversion (EOC) is monitored to see whether conversion is finished. High to low output indicates that the data is converted and ready to be picked up.
- Output enable (OE) pin is activated to read the data out of the ADC chip. A low to high pulse to OE pin will bring digital data out of the chip. To bring the digitized data from ADC to computer, serial communication is done with the help of RS-232. To connect any RS-232 to microcontroller system, voltage converter such as MAX232 is used. It converts the TTL logic levels to the RS232 voltage levels and vice versa. Algorithm of serial communication program to transfer data serially is given below-
- Serial control register (SCON) is initialized with the value 50H, which indicates serial mode 1, where an 8 bit data is framed with start and stop bits.
- Timer mode register (TMOD) is loaded with value 21H, which indicates timer 1 in mode 2 and timer 0 in mode 1.
- Timer 1 is loaded with 0E8H, to set the baud rate of 1200.
- TR1 is set to 1 to start the timer 1.
- The character byte to be transmitted serially is written into SBUF register.
- TI flag is monitored to see if the character has been transferred completely.
- TI flag is cleared for next transmission.

Real time acquisition of PPG signal is done in Matlab so as to identify the frequency contents within the signal and to measure heart rate and respiratory rate of person. Microcontroller 89C51 is used with external 8-bit (0809) analog to digital converter. In 0809 ADC, there is no self clocking and the clock must be provided from an external source to the clock pin. ADC programming is done in assembly language. [8-9] Fig. 4 shows the system block diagram.

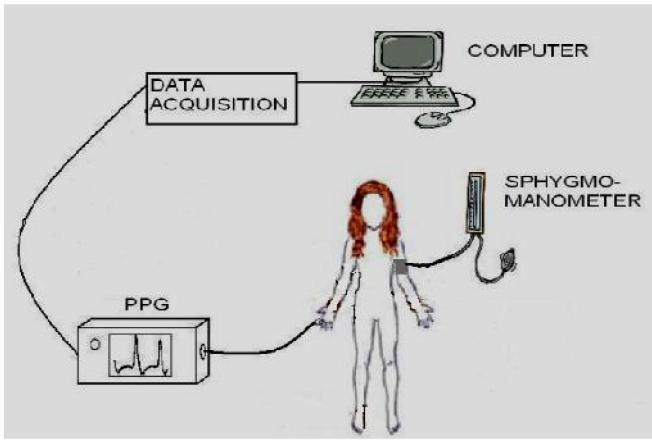


Fig. 4. System Block Diagram

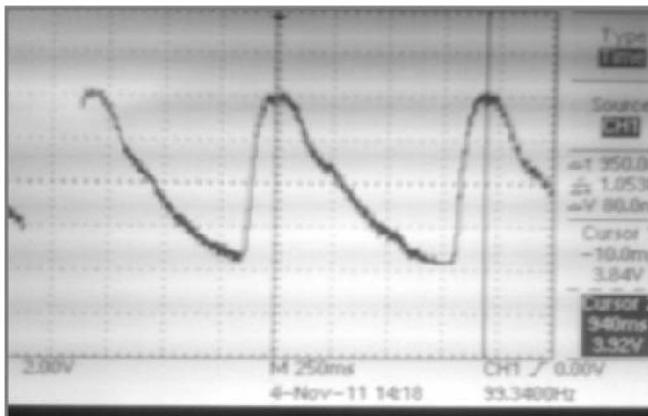


Fig.5 PPG of subject



Fig. 6. Fast Fourier Transform of PPG signal

From the FFT analysis of the PPG signal HR and Respiratory Rate calculated. Fig. 5 shows PPG of subject. Fig. 6 shows Fast Fourier Transform of PPG signal.

C: Blood Pressure Measurement

Once a peak is detected then the peak height is simply the amplitude at the maximum point minus the amplitude at the end of the diastolic time. Table 1 shows correlation coefficients between the systolic and diastolic pressure readings can be calculated using the actual values obtained using the sphygmomanometer . The base line blood pressure values obtained from sphygmomanometer are as follows: [10-13]

$$\text{Systolic BP} = 102 \text{ mm Hg}$$

$$\text{Diastolic BP} = 66 \text{ mm Hg}$$

$$\text{Heart Rate} = 73 \text{ BPM.}$$

Table 1: SBP and DBP Correlation Factor

Trial	SBP Correlation Factor	DBP Correlation Factor
1	$336/102=3.29$	$146/66=2.21$
2	$294/102=2.88$	$152/66=2.303$
3	$284/102=2.78$	$152/66=2.303$
Average	2.98	2.27

Table 2 shows the BP Calculation using Pulse height Correlation Coefficients. [14-15]

Table 2: BP Calculations using the Pulse height Correlation Coefficients

5 th Peak	8 th Peak
SBP: $310/2.98=109$	SBP: $288/2.98=97$
DBP: $158/2.27=69$	DBP: $158/2.27=69$

III. RESULTS AND ANALYSIS

Reflectance type PPG sensor was developed and tested for two parameters namely heart rate, respiratory rate. The amplitude of PPG signals were in range of 100-200mV. The testing subjects were healthy 20-30 years old females. Table 3 shows the heart rate and respiratory rate observed for few people and the results were verified by a standard heart rate meter.

In this paper a noninvasive continuous blood pressure measurements based on only PPG signal is described in detail. PPG signal is used to detect blood pressure pulsations in a finger and achieved an accuracy of (0.8 ± 7) mmHg and (0.9 ± 6) mmHg for systolic and diastolic pressure, respectively. The testing subjects were healthy 18 – 48 year old males and females. The device and the transducer were tested with

several individual and consistent results were received. Table 4 shows Blood pressure result Analysis.

Table 3: Calculation of heart rate and respiratory rate of people

Sr.NO	Age	Gender	Heart rate	Respiratory rate	Heart rate from heart rate meter
1	28	Female	86	14	90
2	29	Female	67	19	66
3	31	Female	72	19	68
4	29	Female	76	14	80

Table 4: Blood Pressure result Analysis

Item	Men	Women
Number	07	09
Age in years	(20-48)	(18-35)
Height in centimeters	165.5 ± 5.6	157.2 ± 4.5
Weight in Kilograms	69.2 ± 5.4	49.5 ± 8.9
BP measured by sphygmomanometer in mmHg (SBP, DBP)	131 ± 6, 85 ± 5	121 ± 4, 83 ± 7
Heart Rate in BPM	67 ± 5	73 ± 4
BP calculated from peak detection	128 ± 7, 83 ± 5	117 ± 4, 83 ± 5

IV. CONCLUSION

PC based system is developed for measurement of cardiovascular parameters. System is tested for normal subjects. Frequency domain analysis of PPG is done using MATLAB for measurement of heart rate and respiratory rate . FFT of the signal shows two main frequency components , the first frequency is in the range of 0.25 to 0.4 Hz and is corresponds to respiratory rate. Second frequency component is in the range of 1 to 1.5 Hz corresponds to heart rate. Blood pressure is measured by measuring the SBP and DBP correlation factors of the PPG .The overall accuracy of the system is ±5 to ±7%.

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Regimen of different seasons

Shishira (winter)

General condition

- Mid-January to mid-March (approximately) is considered as Shishira Ritu (winter).
- During this season, the environment remains cold, along with cold wind.
- The predominant Rasa and Mahabhuta during this season are Tikta (bitter) and Akasha, respectively. The strength of the person becomes less, deposition of the Kapha Dosha occurs and Agni (catabolism) remains in a higher state.

Diet regimen

- Foods having Amla (sour) as the predominant taste are preferred. Cereals and pulses, wheat/gram flour products, new rice, corn, and others, are advised.
- Ginger, garlic, Haritaki (fruits of Terminalia chebula), Pippali (fruits of Piper longum), sugarcane products, and milk and milk products are to be included in the diet.
- Foods having Katu (pungent), Tikta (bitter), Kashaya (astringent) predominant Rasa are to be avoided. Laghu (light) and Shita (cold) foods are advised to be prohibited.

Lifestyle

- Massages with oil/powder/paste, bathing with lukewarm water, exposure to sunlight, and wearing warm clothes are mentioned to follow.
- Vata aggravating lifestyle like exposure to cold wind, excessive walking, sleep at late night, are to be avoided.

Vasanta (spring)

General condition

- The approximate time is from mid-March to mid-May. This season is considered as the season of flowering and origin of new leaves.
- Predominant Rasa and Mahabhuta during this season are Kashaya (astringent), and Prithvi and Vayu, respectively.
- Strength of the person remains in medium degree, vitiation of Kapha Dosha occurs and Agni remains in Manda state.

Diet regimen

- One should take easily digestible foods. Among cereals, old barley, wheat, rice, and others are preferred. Among pulses, lentils, Mugda, and others, can be taken.
- Food items tasting Tikta (bitter), Katu (pungent), and Kashaya (astringent) are to be Ritucharya for lifestyle disorders.
- Besides those, honey is to be included in the diet. Meats like that of Shahsa (rabbit), which are easy to digest, can be taken.
- Foods which are hard to digest are to be avoided.
- Those which are Sheeta (cold), Snigdha (viscous), Guru (heavy), Amla (sour), Madhura (sweet) are not preferred. New grains, curd, cold drinks, and so on, are also to be prohibited.

Lifestyle

- One should use warm water for bathing purposes, and may do exercise during Vasant Ritu.
- Udvartana (massage) with powder of Chandana (Santalum album), Kesara (Crocus sativus), Agaru, and others, Kavala (gargle), Dhooma (smoking), Anjana (collyrium), and evacuative measures, such as Vamana and Nasya are advised.
- Day-sleep is strictly contraindicated during this season.

Grishma (summer)

General condition

- Mid-May to mid-July (approximately) is considered as Grishma (summer) season. Environment is prevalent with intense heat and unhealthy wind. The river-bodies dried and the plants appeared lifeless.
- The predominant Rasa is Katu (pungent) and Mahabhuta are Agni and Vayu.
- The strength of the person becomes less, deposition of Vata Dosha occurs, but the vitiated Kapha Dosha is pacified during this season. Agni of the person will remain in a mild state.

Diet regimen

- Foods which are light to digest—those having Madhura (sweet), Snigdha (unctuous), Sheeta (cold), and Drava (liquid) Guna, such as rice, lentil, etc, are to be taken.
- Drinking plenty of water and other liquids, such as cold water, buttermilk, fruit juices, meat soups, mango juice, churned curd with pepper, is to be practiced. At bedtime milk with sugar candy is to be taken.
- Lavana and food with Katu (pungent) and Amla (sour) taste and Ushna (warm) foods are to be avoided.

Lifestyle

- Staying in cool places, applying sandalwood and other aromatic pastes over the body, adorning with flowers, wearing light dresses and sleeping at day time are helpful.
- During the night one can enjoy the cooled moonrays with breeze. Excessive exercise or hardwork is to be avoided; too much sexual indulgence and alcoholic preparations are prohibited.

Varsha (monsoon)

General condition

- Mid-July to mid-September (approximately) is considered as Varsha Ritu. During this season the sky is covered by clouds and rains occur without thunderstorms.
- The predominant Rasa and Mahabhuta during this season are Amla (sour), and Prithvi and Agni, respectively. The strength of the person again becomes less, vitiation of Vata Dosha and deposition of Pitta Dosha, Agni also gets vitiated.

Diet regimen

- Foods having Amla (sour) and Lavana (salty) taste and of Sneha (unctuous) qualities are to be taken. Among cereals, old barley, rice, wheat, etc., are advised.
- Besides meat soup, Yusha (soup), etc. are to be included in the diet. It is mentioned that one should take medicated water or boiled water.
- Intake of river water, churned preparations having more water, excessive liquid and wine are to be avoided. The foods, which are heavy and hard to digest, like meat, etc., are prohibited.

Lifestyle

- Use of boiled water for bath and rubbing the body with oil properly after bath is advised.
- Medicated Basti (enema) is prescribed as an evacuative measure to expel vitiated Doshas. Getting wet in rain, day-sleep, exercise, hard work, sexual indulgence, wind, staying at river-bank, etc., are to be prohibited.

Sharat (autumn)

General condition

- The period between mid-September to mid-November is Sharat Ritu (autumn).
- During this time the Sun becomes bright, the sky remains clear and sometimes with white clouds, and the earth is covered with wet mud. The predominant Rasa is Lavana (salty) and predominant Mahabhutas are Apa and Agni.
- The strength of the person remains medium, pacification of vitiated Vata Dosha and vitiation of Pitta Dosha occur, and activity of Agni increases during this season.

Diet regimen

- Foods have Madhura (sweet) and Tikta (bitter) taste, and of Laghu (light to digest) and cold properties are advised. Foods having the properties to pacify vitiated Pitta are advised.
- Wheat, green gram, sugar candy, honey, Patola (*Trichosanthes diocia*), flesh of animals of dry land (*Jangala Mamsa*) are to be included in the diet. Hot, bitter, sweet, and astringent foods are to be avoided.
- The food items, such as fat, oils, meat of aquatic animals, curds, etc., are also to be not included in the diet during this season.

Lifestyle

- Habit of eating food, only when there is a feeling of hunger is recommended. One should take water purified by the rays of sun in day time and rays of moon at night time for drinking, bathing, etc.
- It is advised to wear flower garlands, and to apply a paste of Chandana (*Santalum album*) on the body. It is said that moon rays in the first 3h of night are conducive for health.

- Medical procedures, such as Virechana (purging), Rakta-Mokshana (bloodletting), etc, should be done during this season. Day-sleep, excessive eating, excessive exposure to sunlight, etc., are to be avoided.

Hemanta (late autumn)

General condition

- Mid-November to mid-January is considered as Hemanta (late autumn) Ritu. Blow of cold winds starts and chillness is felt.
- Predominant Rasa during this season is Madhura and the predominant Mahabhutas are Prithivi and Apa.
- The strength of a person remains on highest grade and vitiated Pitta Dosha gets pacified. Activity of Agni is increased.

Diet regimen

- One should use unctuous, sweet, sour, and salty foods. Among cereals and pulses, new rice, flour preparations, green gram, Masha, etc., are mentioned to be used.
- Various meats, fats, milk and milk products, sugarcane products, Shidhu (fermented preparations), Ritucharya for lifestyle disorders Tila (sesame), and so on, are also to be included in the diet.
- Vata aggravating foods, such as Laghu (light), cold, and dry foods are to be avoided. Intake of colddrinks is also contraindicated.

Lifestyle

- Exercise, body and head massage, use of warm water, Atapa-sevana (sunbath), application of Agaru on body, heavy clothing, sexual indulgence with one partner, residing in warm places is recommended.
- Exposure to strong and cold wind, habit of day sleep, etc., are mentioned to be avoided.



Review Article

Ritucharya: Answer to the lifestyle disorders

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Abstract

Ritu, the season, classified by different features expresses different effects on the body as well as the environment. Ayurveda has depicted various rules and regimens (*Charya*), regarding diet and behavior to acclimatize seasonal enforcement easily without altering body homeostasis. The prime principle of Ayurvedic system of medicine is preventive aspect, can be achieved by the change in diet and practices in response to change in climatic condition. This is a very important aspect of preventive medicine as mentioned in Ayurvedic texts. Lifestyle disorders are very common in the present era, basically originating from lack of following seasonal regimens due to lack of concentration in seasonal characteristics. A firm scientific analysis is the base, which holds true even on date. In this review article, various regimens in diet and lifestyle as mentioned in the classics of Ayurveda and their importance on lifestyle disorders has been discussed.

Key words: Lifestyle disorders, seasonal regimens, seasonal variations in India

Introduction

Ayurveda, the age old science of life, has always emphasized to maintain the health and prevent the diseases by following proper diet and lifestyle regimen rather than treatment and cure of the diseases. The basic principle followed in the Ayurvedic system of medicine is *Swasthyashya Swasthya Rakshanam*, which means to maintain the health of the healthy, rather than *Aturashya Vikara Prashamanancha*, means to cure the diseases of the diseased.^[1] For this purpose the *Dinacharya* (daily regimen) and *Ritucharya* (seasonal regimen) have been mentioned in the classics of Ayurveda.^[2]

With the change in season, the change is very evident in the environment we live in. We see various changes in bio-life around us, such as flowering in spring and leaf-shedding in autumn in the plants, hibernation of many animals with the coming of winter, and so on. As human being is also part of the same ecology, the body is greatly influenced by external environment. Many of the exogenous and endogenous rhythm have specific phase relationship with each other; which means that they interact and synchronize each other. If body is unable to adopt itself to stressors due to changes in specific traits of seasons, it may lead to *Dosha Vaishamya*, which in turn may

render the body highly susceptible to one or other kinds of disorders.^[3]

As adaptations according to the changes, is the key for survival, the knowledge of *Ritucharya* (regimen for various seasons) is thus important. People do not know or ignore the suitable types of food stuffs, dressing, and others regimen to be followed in particular season, this leads to derangement of homeostasis and causes various diseases, such as obesity, diabetes, hypertension, cancer, and so on. Lifestyle diseases are a result of an inappropriate relationship of people with their environment. Onset of these lifestyle diseases is insidious, delayed development, and difficult to cure.^[4] In our country the situation is quite alarming due to rapid changing of disease profile. The World Health Organization has identified India as one of the nations that is going to have most of the lifestyle disorders in the near future. Nowadays, not only are lifestyle disorders becoming more common, but they are also affecting younger population. Hence, the population at risk shifts from 40+ to maybe 30+ or even younger. Already considered the diabetes capital of the world, India now appears headed toward gaining another dubious distinction of becoming the lifestyle-related disease capital as well. A study conducted jointly by the All India Institute of Medical Sciences and Max Hospital shows the incidence of hypertension, obesity, and heart disease is increasing at an alarming rate, especially in the young, urban population. According to the doctors, a sedentary lifestyle combined with an increase in the consumption of fatty food and alcohol is to blame cases of obesity, diabetes, hypertension, and so on.

Ritucharya is prominently discussed in the first few chapters

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of most of the *Samhitas* of Ayurveda. Prevention of disease to maintain health is being the first and foremost aim of the holistic science of Ayurveda. In *Tasyashitya* chapter of Charaka Samhita, it is said “*Tasya Shitadiya Ahaarbalam Varnascha Vardhate. Tasyartusatmayam Vaditam Chestaharyaprasrayam*,” which means ‘the strength and complexion of the person knowing the suitable diet and regimen for every season and practicing accordingly are enhanced.^[5] Main theme of this chapter is to make people aware concerning the methods to live in accordance with the environment. In this article, the *Ritucharyas* mentioned in the classics of Ayurveda have been discussed and emphasis has been given on the likely impact of *Ritucharya* on lifestyle disorders.

Classification of season

The year according to *Ayurveda* is divided into two periods *Ayana* (solstice) depending on the direction of movement of sun that is *Uttarayana* (northern solstice) and *Dakshinayana* (southern solstice). Each is formed of three *Ritus* (seasons). The word *Ritu* means “to go.” It is the form in which the nature expresses itself in a sequence in particular and specific in present forms in short, the seasons.^[6]

A year consists of six seasons, namely, *Shishira* (winter), *Vasanta* (spring), and *Grishma* (summer) in *Uttarayan* and *Varsha* (monsoon), *Sharata* (autumn), and *Hemanta* (late autumn) in *Dakshinayana*. As *Ayurveda* has its origin in India, the above seasonal changes are observed predominantly in Indian subcontinent.

***Uttarayana* and its effect**

Uttarayana indicates the ascent of the sun or northward movement of the sun. In this period the sun and the wind are powerful. The sun takes away the strength of the people and the cooling quality of the earth. It brings increase in the *Tikta* (bitter), *Kashaya* (astringent), and *Katu* (pungent) *Rasa* (taste), respectively, which brings about dryness in the body and reduces the *Bala* (strength). It is also called *Adana Kala*.

According to modern science, this can be compared with the gradual movement of earth around the sun to the position, in which the rays of the sun falls perpendicularly at 30 degree meridian of the North Pole on June 21st every year, called as summer solstice. The northward journey of the Sun from Tropic of Capricorn to Tropic of Cancer happens.

During *Uttarayana* the seasonal changes in Indian subcontinent is from *Shishira* (winter) to *Vasanta* (spring) and to *Grishma* (summer). The period can be compared to mid-January to mid-July, when warmness and dryness in weather increases. It has an overall debilitating effect on environment, to which human being is also a part.

***Dakshinayana* and its effect**

Dakshinayana indicates the descent of the sun or movement of the sun in southern direction. In this period, the wind is not very dry; the moon is more powerful than sun. The earth becomes cool due to the clouds, rain, and cold winds. Unctuousness sets in the atmosphere and *Amla* (sour), *Lavanya* (salty), and *Madhura* (sweet) *Rasa* are predominant, so the strength of person enhances during this period. It is also called *Visarga Kala*.

According to modern science, this can be compared with the gradual movement of the earth around the sun to the position, in which the rays of the sun fall over 30 degree meridian of

the South Pole perpendicularly on December 21st every year, is called as winter solstice. The southward movement of the Sun occurs from Tropic of Cancer to Tropic of Capricorn.

During *Dakshinayana*, the seasonal changes occur in the Indian subcontinent from *Varsha* (monsoon) to *Sarata* (autumn) and to *Hemanta* (late autumn). This period can be compared to mid-July to mid-January, when cool sets, and due to which anabolic activity dominates over the catabolic activity in the environment.

State of strength

In the beginning of *Visarga Kala* and ending of *Adana kala*, that is, during *Varsha* and *Grishma*, weakness occurs. In the middle of the solstices, that is, during *Sharata* and *Vasanta*, strength remains in moderate grade and in the end of *Visarga Kala* and in the beginning of *Adana Kala*, that is, during *Hemanta* and *Shishira*, maximum strength is seen.^[7]

Regimen of different seasons

***Shishira* (winter)**

General condition

Mid-January to mid-March (approximately) is considered as *Shishira Ritu* (winter). During this season, the environment remains cold, along with cold wind. The predominant *Rasa* and *Mahabhuta* during this season are *Tikta* (bitter) and *Akasha*, respectively. The strength of the person becomes less, deposition of the *Kapha Dosha* occurs and *Agni* (catabolism) remains in a higher state.

Diet regimen

Foods having *Amla* (sour) as the predominant taste are preferred. Cereals and pulses, wheat/gram flour products, new rice, corn, and others, are advised. Ginger, garlic, *Haritaki* (fruits of *Terminalia chebula*), *Pippali* (fruits of *Piper longum*), sugarcane products, and milk and milk products are to be included in the diet.

Foods having *Katu* (pungent), *Tikta* (bitter), *Kashaya* (astringent) predominant *Rasa* are to be avoided. *Laghu* (light) and *Shita* (cold) foods are advised to be prohibited.

Lifestyle

Massage with oil/powder/paste, bathing with lukewarm water, exposure to sunlight, wearing warm clothes are mentioned to follow.

Vata aggravating lifestyle like exposure to cold wind, excessive walking, sleep at late night, are to be avoided.

***Vasanta* (spring)**

General condition

The approximate time is from mid-March to mid-May. This season is considered as season of flowering and origin of new leaves. Predominant *Rasa* and *Mahabhuta* during this season are *Kashaya* (astringent), and *Prithvi* and *Vayu*, respectively. Strength of the person remains in medium degree, vitiation of *Kapha Dosha* occurs and *Agni* remains in *Manda* state.

Diet regimen

One should take easily digestible foods. Among cereals, old barley, wheat, rice, and others are preferred. Among pulses, lentil, *Mugda*, and others, can be taken. Food items tasting *Tikta* (bitter), *Katu* (pungent), and *Kashaya* (astringent) are to be

taken. Besides those, honey is to be included in the diet. Meats like that of *Shahsa* (rabbit), which are easy to digest can be taken.

Foods which are hard to digest are to be avoided. Those which are *Sheeta* (cold), *Snigdha* (viscous), *Guru* (heavy), *Amla* (sour), *Madhura* (sweet) are not preferred. New grains, curd, cold drinks, and so on, are also to be prohibited.

Lifestyle

One should use warm water for bathing purpose, may do exercise during *Vasant Ritu*. *Udvartana* (massage) with powder of *Chandana* (*Santalum album*), *Kesara* (*Crocus sativus*), *Agaru*, and others, *Kavala* (gargle), *Dhooma* (smoking), *Anjana* (collyrium), and evacutive measures, such as *Vamana* and *Nasya* are advised.

Day-sleep is strictly contraindicated during this season.

Grishma (summer)

General condition

Mid-May to mid-July (approximately) is considered as *Grishma* (summer) season. Environment is prevalent with intense heat and unhealthy wind. The river-bodies dried and the plants appear lifeless. The predominant *Rasa* is *Katu* (pungent) and *Mahabhuta* are *Agni* and *Vayu*. The strength of the person become less, deposition of *Vata Dosha* occurs, but the vitiated *Kapha Dosha* is pacified during this season. *Agni* of the person will remain in mild state.

Diet regimen

Foods which are light to digest—those having *Madhura* (sweet), *Snigdha* (unctuous), *Sheeta* (cold), and *Drava* (liquid) *Guna*, such as rice, lentil, etc, are to be taken. Drinking plenty of water and other liquids, such as cold water, buttermilk, fruit juices, meat soups, mango juice, churned curd with pepper, is to be practiced. At bedtime milk with sugar candy is to be taken.

Lavana and food with *Katu* (pungent) and *Amla* (sour) taste and *Ushna* (warm) foods are to be avoided.

Lifestyle

Staying in cool places, applying sandal wood and other aromatic pastes over the body, adorning with flowers, wearing light dresses and sleeping at day time are helpful. During night one can enjoy the cooled moonrays with breeze. Excessive exercise or hardwork is to be avoided; too much sexual indulgence and alcoholic preparations are prohibited.

Varsha (monsoon)

General condition

Mid-July to mid-September (approximately) is considered as *Varsha Ritu*. During this season the sky is covered by clouds and rains occur without thunderstorm. The ponds, rivers, etc., are filled with water. The predominant *Rasa* and *Mahabhuta* during this season are *Amla* (sour), and *Prithvi* and *Agni*, respectively. The strength of the person again becomes less, vitiation of *Vata Dosha* and deposition of *Pitta Dosha*, *Agni* also gets vitiated.

Diet regimen

Foods having *Amla* (sour) and *Lavana* (salty) taste and of *Sneha* (unctuous) qualities are to be taken. Among cereals, old barley, rice, wheat, etc., are advised. Besides meat soup, *Yusha* (soup), etc. are to be included in the diet. It is mentioned that one

should take medicated water or boiled water.

Intake of river water, churned preparations having more water, excessive liquid and wine are to be avoided. The foods, which are heavy and hard to digest, like meat, etc., are prohibited.

Lifestyle

Use of boiled water for bath and rubbing the body with oil properly after bath is advised. Medicated *Basti* (enema) is prescribed as an evacutive measure to expel vitiated *Doshas*.

Getting wet in rain, day-sleep, exercise, hard work, sexual indulgence, wind, staying at river-bank, etc., are to be prohibited.

Sharat (autumn)

General condition

The period between mid-September to mid-November is *Sharat Ritu* (autumn). During this time the Sun becomes bright, the sky remains clear and sometimes with white cloud, and the earth is covered with wet mud. The predominant *Rasa* is *Lavana* (salty) and predominant *Mahabhutas* are *Apa* and *Agni*. The strength of the person remains medium, pacification of vitiated *Vata Dosha* and vitiation of *Pitta Dosha* occur, and activity of *Agni* increases during this season.

Diet regimen

Foods are having *Madhura* (sweet) and *Tikta* (bitter) taste, and of *Laghu* (light to digest) and cold properties are advised. Foods having the properties to pacify vitiated *Pitta* are advised. Wheat, green gram, sugar candy, honey, *Patola* (*Trichosanthes dioicia*), flesh of animals of dry land (*Jangala Mamsa*) are to be included in the diet.

Hot, bitter, sweet, and astringent foods are to be avoided. The food items, such as fat, oils, meat of aquatic animals, curds, etc., are also to be not included in the diet during this season.

Lifestyle

Habit of eating food, only when there is a feeling of hunger is recommended. One should take water purified by the rays of sun in day time and rays of moon at night time for drinking, bathing, etc. It is advised to wear flower garlands, and to apply paste of *Chandana* (*Santalum album*) on the body. It is said that moon rays in the first 3 h of night is conducive for health. Medical procedures, such as *Virechana* (purging), *Rakta-Mokshana* (blood letting), etc, should be done during this season.

Day-sleep, excessive eating, excessive exposure to sunlight, etc., are to be avoided.

Hemanta (late autumn)

General condition

Mid-November to mid-January is considered as *Hemanta* (late autumn) *Ritu*. Blow of cold winds starts and chillness is felt. Predominant *Rasa* during this season is *Madhura* and the predominant *Mahabhutas* are *Prithivi* and *Apa*. The strength of a person remains on highest grade and vitiated *Pitta Dosha* gets pacified. Activity of *Agni* is increased.

Diet regimen

One should use unctuous, sweet, sour, and salty foods. Among cereals and pulses, new rice, flour preparations, green gram, *Masha*, etc., are mentioned to be used. Various meats, fats, milk and milk products, sugarcane products, *Shidhu* (fermented preparations),

Tila (sesame), and so on, are also to be included in the diet.

Vata aggravating foods, such as *Laghu* (light), cold, and dry foods are to be avoided. Intake of colddrinks is also contraindicated.

Lifestyle

Exercise, body and head massage, use of warm water, *Atapa-sevana* (sunbath), application of *Agaru* on body, heavy clothing, sexual indulgence with one partner, residing in warm places is recommended.

Exposure to strong and cold wind, habit of day sleep, etc., are mentioned to be avoided.^[2,8-13]

Discussion

This is the way the ancient sages set up the regimen for various seasons on analytical reasoning to obtain *Swastha* (health) and prevent the diseases. The examples set by them stand as a hint to decide other dos' and don'ts' in the regimen—*Ritucharya* [Table 1].

The environmental factors include the nature of the land, water,

and various atmospheric phenomena, including temperature, humidity, wind, rain, clouds, and atmospheric pressure. All these environmental factors undergo a continuous change and at a time, no two moments are exactly alike in a given place. Thus with the rising Sun the temperature keeps on rising and gradually drops at night. The maximum and minimum temperature fluctuates daily but it is highest in summer and lowest in winter. Similarly, all these factors show diurnal as well as seasonal variations and these variations for a particular time are known as season.^[14]

A study on animals with seasonal changes revealed the effects of photoperiod on immune function and hormone synthesis which influence the development of opportunistic disease.^[15] Another study indicated that free-living species from many regions can seasonally modulate glucocorticoid release. In other words, the magnitudes of both unstressed and stressed glucocorticoid concentrations change depending on the time of the year.^[16]

A human clinical study was carried out by Mallika *et al.* to assess the biophysical and biochemical changes occurring due to *Ritusandhi*. Clinical study shows provocation of *Tridosha* with the

Table 1: Table summarizes the seasonal Do's and Don'ts

Season	Wholesome diet	Unwholesome diet
<i>Sisira Ritu</i> (winter)	Rice (<i>Oryza sativa</i>), Wheat (<i>Triticum aestivum</i>), <i>Tila</i> (<i>Sesamum indicum</i>), etc., Milk and milk products, sugarcane (<i>Saccarum officinarum</i>) and its products—jaggery, etc., fats, edible oil, flour products, green vegetables, <i>Sunthi</i> (<i>Zingiber officinale</i>), <i>Lashuna</i> (<i>Allium sativum</i>), <i>Haritaki</i> (<i>Terminalia chebula</i>), <i>Pippali</i> (<i>Piper longum</i>), etc.	Cold drinks, <i>Vata</i> aggravating foods like Bengal gram/ <i>Chana</i> (<i>Cicer arientinum</i>), etc.
<i>Vasanta Ritu</i> (spring)	Rice (<i>Oryza sativa</i>), wheat (<i>Triticum aestivum</i>), maize (<i>Zea mays</i>), barley (<i>Hordium vulgare</i>), green gram (<i>Vigna radiate</i>), lentil (<i>Lens culinaris</i>), red gram (<i>Cajanus cajan</i>), etc. Honey, <i>Khadir</i> (<i>Acacia catechu</i>), <i>Musta</i> (<i>Cyprus rotundus</i>), ginger (<i>Zingiber officinale</i>), <i>Haridra</i> (<i>Curcuma longa</i>), <i>Tulsi</i> (<i>Ocimum sanctum</i>), <i>Neem</i> (<i>Azadirachta indica</i>) leaves, etc.	Too much of foods having sour, bitter, and astringent taste.
<i>Grishma Ritu</i> (summer)	Rice (<i>Oryza sativa</i>), green gram (<i>Vigna radiate</i>), etc. Fruits such as mango (<i>Mangifera indica</i>), water melon (<i>Citrulus vulgaris</i>), fruit juices, coconut water, <i>Takra</i> (buttermilk), curd with pepper (<i>Piper nigrum</i>), meat juices, Jaggery (<i>Gur</i>), fennel (<i>Foeniculum vulgare</i>), etc.	Light foods like puffed rice, etc.
<i>Varsha Ritu</i> (monsoon)	Old barley (<i>Hordium vulgare</i>), rice (<i>Oryza sativa</i>), wheat (<i>Triticum aestivum</i>), etc.	Cold drinks, too much of sweet foods like sweets prepared from milk.
<i>Sharat Ritu</i> (autumn)	Meat soup, <i>Yusa</i> (soup), <i>Panchakola</i> (<i>Piper longum</i> , <i>Piper chaba</i> , <i>Plumbago zeylanicum</i> , <i>Zingiber officinale</i>), <i>Saindhav Lavana</i> (rock salt), etc.	Sour foods like curd, etc.
<i>Hemanta Ritu</i> (late autumn)	Easily digestible cereals and whole pulses, green gram (<i>Vigna radiate</i>), etc. <i>Sarkara</i> (sugar-candy), flesh (<i>Jangala mamsa</i>), vegetables like <i>Patola</i> (<i>Trichosanthes dioica</i>), fenugreek (<i>Trigonella foenum</i>), etc., fruits, such as <i>Amlaki</i> (<i>Phyllanthus emblica</i>), dates (<i>Phoenix sylvestris</i>), grapes (<i>Vitis vinifera</i>), etc.	Fatty and oily foods.
	Rice (<i>Oryza sativa</i>), wheat (<i>Triticum aestivum</i>), black gram (<i>Vigna mungo</i>), etc.	Heavy foods like meats (in excess), new grains, black gram (<i>Vigna mungo</i>), etc.
	Milk and milk products, sugar-cane (<i>Saccarum officinarum</i>) juice and its products, fats and oils, fermented preparations, <i>Sunthi</i> (<i>Zingiber officinale</i>), <i>Lashuna</i> (<i>Allium sativum</i>), <i>Haritaki</i> (<i>Terminalia chebula</i>), <i>Pippali</i> (<i>Piper longum</i>), fenugreek (<i>Trigonella foenum</i>), <i>Tila</i> (<i>Sesamum indicum</i>), etc.	Heavy and warm foods like <i>Urad/black gram</i> (<i>Vigna mungo</i>), mustard (<i>Brassica campestris</i>), etc.
		Excess of meat, salt, chilli, etc.
		Excessive liquid and wine, river water, churned and fermented preparations, etc.
		Heavy diet, excess of salts, etc.
		Sour and fermented foods, such as curd, etc.
		Fats and oils, meat of aquatic animals, etc.
		Cold drinks,
		<i>Vata</i> aggravating foods, such as Bengal gram/ <i>Chana</i> (<i>Cicer arientinum</i>), etc.
		Light foods, such as puffed rice, etc.

dominance of *Vata* and *Kapha* provocation. In this study during *Ritusandhi* frequently, *Jwara*, *Pratishyaya*, and *Alasya Lakshnas* were met with. In *Agnibala* also although remarkable changes are seen, they are not up to pathologic mark. Regarding the biochemical changes, there is a varied pattern—sometimes increasing and decreasing, but all these are within the range of normal variations. The variation in biochemical values are seen but not remarkable.^[3]

One study carried out by Jangid *et al.* on the concept of *Ritus* and their effect on *Bala* reported that the overall effect of *Hemanta Ritu* on *Bala* of healthy volunteers was maximum, effect of *Vasanta Ritu* was moderate and the effect of *Varsha Ritu* was minimum, and concluded that *Hemanta* is the *Ritu* of *Pravara Bala*, *Vasanta* is the *Ritu* of *Madhyama Bala* and *Varsha* is the *Ritu* of *Avaya Bala*. Results of the study support the principles of *Ayurveda*.^[14]

Many other systems of medical science have observed the influence of seasonal rhythm in physical and mental health. To quote Hippocrates, “Whoever wishes to investigate medicine properly should proceed thus in the first place to consider the seasons of the year and what affect each of them produces.”^[17] Even in Tibetan system of medicine, seasons are regarded as one of the fundamental factors in etiology and pathology, and a powerful instrument in the prevention of diseases.

In *Ayurveda*, the knowledge of *Ritucharya* is a first hand guide to the concept of *Kriya-Kala*, which describes the modes and stages of the development of diseases, with regard to the state of different *Doshas*—*Vatu*, *Pitta*, and *Kapha* in accordance with the changes of time. A good understanding of it is very much essential for early diagnosis and prognosis for adopting preventive and curative measures.

It is to be known that disharmony in the *Doshas*—*Vatu*, *Pitta*, and *Kapha* results in *Roga* (disease). And aim of the science of *Ayurveda* is to maintain the harmony. With changes in diet and lifestyle, there are changes in the state of *Tridosha*, which is bound to affect us, resulting disharmony, causing lifestyle diseases. *Ritu* acts as *Vyanjaka* or *Nimittakarana* in the aggravation and manifestation of disease. For example, an evening (afternoon) headache is essentially with *Vata* predominance. Diseases due to *Vata* show a tendency to aggravate during the rainy season.^[18]

It has been observed that there is an increased occurrence of flu, dry skin in winter, heat stroke in summer, pollen allergy in spring, high incidence of air and water borne diseases in rainy season, and skin diseases in autumn. Thus it can be said that physiology vindicates the concept of *Ritucharya*.^[19] Studies have even revealed the increased incidence of Asthma attack in winter season. There is also a reference of Seasonal Affective Disorder in modern science.^[20]

Peoples' diet changed substantially in the second half of 20th century, generally with increased consumption of meat, dairy products, vegetable oils, fruit juice, and alcoholic beverages, and decreased consumption of starchy staple foods, such as bread, potatoes, rice, and maize flour. These observations suggest that the diets [or lifestyle] of different populations might partly determine the rates of cancer, and other lifestyle disorders, such as obesity, diabetes, cardiovascular diseases, etc.^[21] In 1900, the top three causes of death in the United States were pneumonia/influenza, tuberculosis, and diarrhea/enteritis. Communicable

diseases accounted for about 60% of all deaths. In 1900, heart disease and cancer were ranked number 4 and 8, respectively. Since the 1940s, the majority of deaths in the United States have resulted from heart disease, cancer, and other degenerative diseases. And, by the late 1990s, degenerative diseases accounted for more than 60% of all deaths.^[22]

Already considered the diabetes capital of the world, India now appears headed towards gaining another dubious distinction of becoming the lifestyle-related disease capital as well. A study conducted jointly by the All India Institute of Medical Sciences and Max Hospital shows that the incidence of hypertension, obesity, and heart disease is increasing at an alarming rate, especially in the young, urban population.^[23]

Doctors however say a strict diet and regular exercise along with cholesterol controlling drugs can go a long way in checking lifestyle diseases. But with the knowledge of *Ritucharya* we can surely avoid these by practicing regimen in accordance with the *Ritu* to maintain the harmony of the *Tridosha* and to stay healthy ever. Growing public awareness, with the support of the government and corporate wellness programs may help arrest the rapid increase in the incidence of such diseases, saving lives and crores of rupees in costs.

With global warming and variation in the advent of season, it can surely be a query, of the importance of *Ritucharya* in the present scenario. It is to be understood that the background on which *Ritucharya* is based, that is, *Dosha* and *Panchamahabhuta* theory. Although today *Ritus* do not follow uniformity, the level of *Dosha* and *Panchamahabhuta* can be analyzed accordingly, to decide the regimen, to which this knowledge of *Ayurveda* holds as a pathfinder. These principles surely demand a closer observation for clarity.

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हिन्दी सारांश

ऋतुचर्या: रहन सहन जनित रोगों का उपचार

जयेश ठक्कर, सु. चौधरी, पि. के. सरकार

ऋतु-मौसम के बदलाव का शरीर और वातावरण पर अनोखा प्रभाव पड़ता है। आयुर्वेद के अनुसार अलग-अलग ऋतु के विभिन्न आचार-आहार और विहार होते हैं, आहर उस ऋतु की अनुकूलता से होते हैं, जो शरीर का संतुलन बनाने में लाभदायक होते हैं। आयुर्वेद का मुख्य उद्देश्य है स्वास्थ्य की रक्षा, जो कि ऋतुचर्या के पालन से प्राप्त होता है। वर्तमान काल में ''लाइफस्टाइल (रहन सहन) जनित रोग'' की वृद्धि हो रही है। इसका मुख्य कारण शरीर और वातावरण के निजी संतुलन का बिगड़ना है। ऋतुचर्या का एक वैज्ञानिक आधार है और उसका पालन आज के समय की आवश्यकता है। प्रस्तुत अध्ययन में आयुर्वेद शास्त्रों के ऋतुचर्या संबंधी सिद्धांत और उनका महत्व, विशेष रूप से रहन-सहन जहनत रोगों की भूमिका पर प्रकाश डाल गया है।

IMPORTANCE OF DINCHARYA IN AYURVEDA: A REVIEW ARTICLE**Dr. Navedita Kumari^{*1} and Dr. Anupam Pathak²**¹PG Scholar Deptt of Swasthvritta & Yoga.²Professor & H.O.D. Deptt of Swasthvritta & Yoga.

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ABSTRACT

Health includes one's reserve of physical strength and stamina as well as mental steadiness to meet the requirements of the daily life. Only healthy individual of sound body and mind can endure social and cultural pressures. Health not only means freedom from the disease, but the ability to work with the satisfaction and self control. Health is the best root factor in achieving Dharma (attain pious acts), Artha (wealth), Kama (desire) and Moksha (salvation). Lifestyle change, more than any other factor, is considered to be the best way of preventing the disease and early death in our society. When people in western society die before the age of 65, it is considered to be early or premature death. Many factors contribute to early death. The major causes of early death have changed from infectious diseases to chronic lifestyle-related conditions. The most important is unhealthy lifestyles that contribute to more than half of all early deaths. One who wants to keep fit himself for whole of his life time should also be fit for every day. Health depends on how one spends day. The ideal life style for a day is called as daily regimen (Dinacharya). Daily regimen explains the various duties from one day to the next day.

KEYWORDS: Health, Daily regimen, Life style disorder, Food items.**INTRODUCTION**

Ayurveda emphasizes importance to maintenance of health of a healthy person and curing the disease of an ill. To maintain the health some activities are mentioned in Ayurveda under the term dinacharya. By following daily regimen (Dinacharya) one will be able to follow a healthy lifestyle thereby maintaining health.

Health is a state of complete physical, mental, social and spiritual well being and not merely the absence of disease. (Acc. to WHO). According to Ayurveda, man is said to be healthy (Swastha) whose humors (Doshas), tissues (Dhatus), excretory products (Malas), and digestive capacity (Agni) are in the state of equilibrium along with mental sensory and spiritual pleasantness and happiness.

Fundamental texts of Ayurveda opine that diseases affect both in mana and share- era which shows the importance given to both physical and mental health in Ayurveda.

A person in good health should wake up, for protecting his life in Brahma muhurta, after considering the position of digestion or indigestion. One should excrete the urine and feces only after getting the urge, facing the north during daytime and should south during night. One should do achamana (clean) after the following acts

touching excreta, tears, fat, hair, and nails separated from the body, after taking bath, before and after taking the food and getting up from the sleep and after sneezing. After this one should chew the dantha dawana (Brush) sticks meant for cleaning the teeth. Sticks used for brushing teeth should be of Arka, Khadira, Karaveera, Arimeda, Apamarga. They should be astringent, bitter. One should daily apply the collyrium called Sauviram, which is beneficial to the eyes; by this eyes become beautiful, sharp to see even minute objects. Then Anutaila is to be dropped into the nose & next gandusha should be held. One should next undertake use of smoke i.e. inhalation of smoke.

Actions which produce weariness to the body are called exercise or Vyayama. By exercise, feeling of lightness of the body, ability to do work, intensity of fire, reduction of fat is produced.

Massage of the body subsides, Ka- pha, dissolves the fat produces firmness to the limbs and gives good appearance to the skin.

Bath stimulates digestive fire, increases span of life Ojus and strength. It also removes itching, dirtiness, fatigue, sweat, lassitude, thirst etc.

One should take the food, according to the rules laid down with a pleasant mind, after offering to fire- God, after giving charity to poor food should be prepared all and not for self alone.

DISCUSSION

Life style disorders Overweight and obesity are associated with high blood pressure / cholesterol levels and increased risk of developing diabetes (insulin resistance). Excess body fat accounts for nearly 60% of diabetes and 20 % of cardiovascular disease respectively. Elevated cholesterol alone is responsible for 60% of CVD morbidity globally.

Major diseases of the 21st century like diabetes and hypertension affects our body and causes very severe effects over body. They are remaining silent for 5 to 7 years. Thus they are called as 'silent killers'. They effect very severely over vital organs like- kidney, eye, heart, brain etc. There can be no symptoms for diseases like - high cholesterol, high blood sugar, and high blood pressure.

All these diseases are caused due to unhealthy lifestyle and dietary habits. People who experienced chronic anxiety, long period of sadness and negativity, unremitting tension were found to have double the risk of disease- including asthma, arthritis, headaches, peptic ulcers and heart disease.

Now a days the above mentioned life style disorders are affecting today's society, as one of the quotation says that "Prevention is better than cure". We can prevent the diseases by maintaining the life style. For preventing the diseases we should follow the above mentioned healthy diet, exercise, positive attitude and yoga. So these lead to the healthy life style. Waking up in Brahma muhurtha i.e. 'two hours before the sunrise', Brahma is knowledge, which is gained by reading. It is the time which is ideal for gaining of the knowledge. And also now a day, there is a lot of pollution in the environment. And in the morning hours it will be clean without pollution. Along with the clean air, the pleasant atmosphere, absence of noise, the morning rays of the rising sun is very beneficial to the health. Sun is the god of health. Health is got from the sun. So, one should get up early in the morning before sunrise.

Achamana means to wash, which will be done after cleaning the excreta, tears, sneezing, and after travelling. It will helpful for the digestion of food, and also evacuation of the bowel completely. Danta dhavana:

One should brush in the morning with twigs of Arka, Vata, Khadira, Karanja, and Arjuna. One should brush in vertical direction from bottom to top. So by doing this it brings freshness, takes away the bad odor, coating on the teeth and creates desires for the food. But in modern age by using chemicals the pastes are going to be prepared. So those are not useful for the modern era to have a long

life. Jihva nirlekhana: It should be done with the help of gold, silver, or iron. It will benefit in bad odor of mouth, cure edema, and gives taste. Now a day those metals are very costly so at least we can use at least steel items.

Gandusha and Kavala: It gives strength to mandible, clarity of mouth, lightness and clarity of sense organs. And also gives good taste. In modern era such items are prepared with chemicals, so one should avoid those chemical items.

Anjana: It cleans the eyes, which makes them shine like the bright moon in clear sky.

Dhumapana: Smoking is the procedure to take smoke through the nostril and then through the mouth. It gives benefits like lightness of the chest, throat, head, and liquefaction of the Kapha. In modern era smoking is completely different and fashionable because they are taking the smoke through the mouth and leaving out through the nostril. And that cigarette contains nicotine like harmful things which will affect the lungs. So by smoking with these things in- stead of increasing the life span they will decrease the life span.

Nasya: Head is considered as the most important part of the body. So nose is the entry way for the head. It causes benefits like lightness of the head, proper sleep, and awakening, cure of diseases, clarity of organs, and pleasant mind. In modern days nasal insufflations are there. So they are prepared from plant origin they are good for health.

Vyayama: by doing regularly exercise nourishes the body, gives good complexion, proportionate the body parts, enhances agni, avoids laziness and obesity, provides lightness of the body parts, and also avoids early aging. It lowers the body fats, reduces the risk of heart disease. And lowers LDL and raises HDL. It helps for the controlling the blood sugar, reduces the risk of osteoporosis and cancer, helps for giving energy, reducing the stress, improves the sleep, to enhance mode of work and the selfesteem. In modern days about exercise they are having knowledge so that will improve individual life span.

Abhyanga: By taking proper massage it delays aging, cures tiredness and vata disorders, and improves vision, complexion, nourishment, life, sleep. And by doing padaabyanga, it provides strength and stability to feet, improves the vision and pacifies the vata. By doing Shiroabyanga it prevents the balding, graying, hair fall, strengthens the hair root, and makes the hair long and black. And it also nourishes the sense organs, softens the skin,

Udvartana: By doing this blood vessels become dilated and complexion in the skin is enhanced. Cures rashes, vata diseases, enhances the strength of thighs, and provides the lightness.

Samavahana: Gentle massage enhances the affection, sleep, virility, avoids the Kapha and also improves the circulation. By massage therapy the people will have an idea about the benefits. So the people are interested to go towards the massage centers. They will definitely increase the life span of the individual.

Snana: Taking bath is auspicious, enhances virility, longevity, strength, compactness and ojas, at the same time it cures tiredness, sweat and impurities of the body. It takes away the sleep, burning sensation, sweat, thirst and unpleasantness due to sweat.

Aahara: One should start Ahara with Madhura rasa then amla, lavana, tikta, katu, Kashayaa. Like this one should take Ahara in a chronological order. And one should take anupana as jala. Because this Ahara rasa gives strength, bala, varna, pushti, dhatus, poshana, indriya prasadata etc.

Healthy food items

Fruits, roasted cereals like gram, peanuts, pulses etc. Sprouted cereals, Puffed rice, Chhole Ghanji, butter milk (mattha) are considered as healthy food items. It is needed to change our style of food as: Consume a diet rich in vegetables and fruits (all colored), avoid eating more high calorie fruits (mango, banana, jack fruit etc), whole fruit is better than fruit juice because it contains fiber. Vegetables which are green, reduces fat and blood sugar level. Stop or minimize alcohol intake, because alcohol is hollow calorie drink. And have sufficient water such as 3 to 3.5 lit/day. Prepare food by boiling, roasting, steaming, baking and avoid frying.

Tambula: After taking the food one should take Tambula (betel leaves and nut) because it will give oral hygiene, digestion of food gives good smell. And improve functions of Indriyas. Mental health and social health now a day we are seeing the 80% of diseases are psychosomatic. For every emotion there is chemical secretion in the body like anger, hostility, frustration, violence, depression, etc. Factors which decide our attitude are environment: (home, school, work, media, cultural, religious, social, political etc.) Experience: (reference point of our actual experience). Education: (formal and informal), etc.

CONCLUSION

Ten healthy lifestyles have been identified that are associated with reduced disease risk:

- Increased wellness
- Regular physical activity
- Eating well
- Managing stress
- Avoiding destructive habits
- Practicing safe sex
- Adopting good safety habits
- Learning first aid
- Adopting good personal health habits
- Protecting the environment.

Just as unhealthy lifestyles are the principal causes of modern day illnesses, healthy lifestyles can result in an improved feeling of wellness that is critical to optimal health. In recognizing the importance of "Years of healthy life," the public health service also recognizes what it calls "Measures of well-being." This well-being or wellness is associated with social, mental, spiritual, and physical functioning. So "Health management is free and enjoyable; But disease management is very costly and painful."

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Article-Role of *Dincharya* Regimen towards Attaining Positive Health

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Abstract:

Ayurveda is the science which mentioned various principles for prevention and treatment of diseases. It is the science which laid emphasis on the preventive aspect. *Dincharya* (daily regimen) is one of the principles mentioned in *Ayurveda* in context to prevention. In today's scenario, the daily routine of each individual has become so busy and hectic, that many of the non-communicable diseases (lifestyle disorders) have taken the form of epidemic in current era. *Ayurveda* perceives that positive health depends on a healthy lifestyle of an individual. According to W.H.O.-sedentary lifestyle, unhealthy dietary habits and exposure to pollution are the triggering factors for most of the lifestyle disorders which will cause over three quarter of all deaths in 2030. Acc. to *Ayurveda* texts, *Kala* (time) is one of the causative factors (i.e. *trividha hetu*) in the initiation of diseases. The daily regimens if followed regularly terminates all the changes which can occur due to time at primary level as well as it slows down the irreversible changes occurring with the passage of time (age), thereby keeping the person healthy and disease free. These daily regimen procedures have beneficial physiological effects on proper functioning of the body thereby maintaining a state of equilibrium of three humors (*Vata*, *Pita*, and *Kapha*), seven tissues, three waste products and the power of digestion along with pleasant mind, soul and sense organs, which in turn helps to attain positive health.

Keywords: *Ayurveda, Dincharya, Kala, Ahara, Vihara, Svastha, srotas.*

INTRODUCTION:

Ayurveda is the ancient science of life. It is the science which not only deals with the curative aspect of diseases but gives more importance to preventive aspect¹ “Prevention is better than cure”. There is a close relationship between lifestyle of an individual and the state of health and disease². Lifestyle refers to someone's way of living or we can say the dietary (*Ahara*) and behavioral (*Vihara*) choices of an individual that he/she usually practices in daily routine of life.

Health is not merely ‘the absence of disease’. Health has evolved over the centuries as a concept from an individual concern to a worldwide social goal and encompasses the whole quality of life. The W.H.O. (1948) accepted definition of health-Health is a state of complete physical, mental and social well being and not merely an absence of disease or infirmity³.

In a broad sense, the state of positive health implies the notion of “perfect functioning” of the body and mind.

Acharya Sushruta defined healthy person as – He ,in whom ,the three *doshas*(*vata,pitta,kapha*), *Agni* (digestive power),the seven *dhatus* (tissues), *malas* (waste products) and their activities are normal, his soul, sense organs and mind are calm/ clear , is called ‘*Svastha*’(healthy person).⁴

Thus, Acharya Sushruta, while defining a healthy person includes both physical and mental dimensions of health.

Therefore, the health is multidimensional. We can conceptualize health biologically as a state in which every cell and every organ is functioning at optimum capacity and in perfect harmony with the rest of the body. In addition, a healthy person should have the ability to respond to the many varied experiences of life with flexibility. He should have a sense of harmony and integration with other members of the society.

The science of *ayurveda* has 2 objectives—“*swasthasya swaasthyarakshnam aatusasya vikaara prashamnam ch*”²-i.e. to maintain the positive health in the individuals who are healthy and to treat the persons who are suffering from disease.

For fulfillment of the first objective (to maintain positive health in healthy individuals), *Ayurveda* has mentioned some lifestyle strategies:

- 1.) *Dincharya* (daily regimen)
- 2.) *Ritucharya* (seasonal regimen)
- 3.) *Sadvritta* (Good moral conducts)
- 4.) *Ashtang Yoga* (Eightfold yoga path first described in *Patanjali's Yoga Sutras*)

All these strategies are preventive rather than curative and *dincharya* (daily regimen) is one of these preventive principles of *ayurveda*⁵.

These daily regimens if followed regularly have beneficial physiological effects on our body and our mind.

MATERIALS AND METHODS:

Various *ayurvedic* classic texts –*charaka samhita*, *Sushruta samhita*, *Ashtang Samgraha*, *Ashtang hridaya*, *Bhava prakasha* were used as source materials. Apart from this, websites and modern books on preventive and social medicine were also searched for this study.

VARIOUS DINCHARYA MODALITIES AND THEIR BENEFICIAL EFFECTS ON BODY AND MIND:-

Ayurveda describes some daily regimen modalities for maintenance of positive health required for achievement of a long, healthy active life, achieving satisfactory enjoyment of life and attainment of self realization.

1.) ***Brahmamuhurta jagrana***⁶: It is advisable to wake up during *Brahma muhurta* (early in the morning i.e. 90 minutes before sunrise.)⁷

- Nascent oxygen in the atmosphere in the early morning easily and readily mixes up with hemoglobin to form oxy-hemoglobin which nourishes the remote tissues rapidly.
- Exposure to bright light in early morning causes the release of serotonin (neurotransmitter biochemically derived from tryptophan)⁸ which contributes to feelings of well being and happiness and keeps the person active and alert⁹.
- In the early morning, there is minimal pollution (noise, water, air) which enhances the concentration.

Today's modern lifestyle results into development of many faulty habits like late night sleeping and waking up late in the morning.

Late night sleeping or chronic sleep loss causes the elevation of cortisol which in turn is responsible for rise in B.P (secondary hypertension) and is likely to promote the development of insulin resistance, a risk factor for obesity and diabetes.¹⁰

(2) ***Ushna jalpana***¹¹: 1-2 glasses of water kept for whole night should be taken before sunrise.

- Not drinking enough water in a day is also a triggering factor for renal stones, haemorrhoids and constipation.

(3) ***Shauchvidhi***⁷: Every person should eliminate the natural urges (faeces and urine) daily.

- Defecation at proper time clears the rectum, increases digestive power, and prevents various manifestations like constipation, foul smelling flatus.

(4) ***Achamana***¹² / ***Mukha –netra prakshalana***¹³ (Washing of face and eyes):- To prevent eye diseases.

(5) ***Dantadhavana* (Tooth brushing)**¹⁴:- It is directed to clean the teeth in the morning and after taking meals.¹⁵

- It stimulates taste perception and increases the salivation.
- Saliva contains salivary amylase(ptyalin) which plays a role in breaking down food particles entrapped within dental crevices, thus protecting teeth from bacterial decay.¹⁶
- Saliva contains lysozyme and secretory IgA which act as antimicrobial agents¹⁶.
- In ayurvedic texts, it is mentioned to clean the teeth by chewing twigs of certain medicinal plants which makes the gums stronger and is also a good exercise of facial muscles.

(6) ***Jihva –nirlekhana* (tongue cleaning)**:- Tongue should be cleaned by a long flexible strip of metal or plant material.

- According to acupressure theory, tongue has many more acupressure points which initiate the proper functioning of vital organs like liver, kidney, bladder, stomach, intestine.

(7) ***Anjana* (application of collyrium in eyes)**:- In today's time, excessive work on computer results in dry eye or computer vision syndrome.

- When *Anjana* dravyas are applied, it causes irritation to eyelids and conjunctiva and enhances the circulation.
- Many researchers predict that high frequency emerging from cell phones increases the stress level and may also cause vision problems.

(8) ***Nasya* (oily nasal drops)**:-

- Sticky nature of the nasya dravyas (anu taila, katu taila) avoids the entry of dust particles into the nasal tract.
- The olfactory nerve endings are seen on cribriform plate of ethmoid bone¹⁷, Nasya dravyas triggers the nerve endings and sends the message to the CNS and initiates the normal physiological functions of the body.

(9) ***Sneha gandusha dharana* (Retaining oil in mouth)**:-

- The *sukhoshna* (lukewarm) *gandusha* and *kavala* dravyas are used which improves the circulation of oral cavity.
- Gargling procedure of *kavala* poses the massaging effect over the oral mucosa and even strengthens the muscles of cheek, face and jaw bones.

(10) ***Dhumpana* (medicated fume inhalation)**:-

- When the *dhumpana* dravyas are lightened with fire, it releases the smoke, soot and even CO₂. Carbon atom in CO₂ has the tendency to stimulate the respiratory centre present in brain stem which may triggers the normal physiological function of respiratory system¹⁸.
- Disinfective action of the *dhumpana* dravyas like *haridra*, *guggulu* and *vacha* cleanses the respiratory tract, oral cavity and pharynx.

(11) ***Tambula bhakshana* (chewing betel leaves)**:-

- stimulates the taste bud
- Increases salivation (Ptyalin enzyme¹⁶), scraps the deposited matter.

(12) **Abhyanga (oil massage):-** A person should do oil massage daily.

- Massage enhances the overall blood circulation and transport the potency of drugs to desired part.
- Massage triggers the acupressure point which induces the release of endorphins which shows analgesic effect¹⁹

(13) **Vyayama (Physical Exercise):-**

- Physical Exercise increases the carbohydrate metabolism (Glycolysis) and causes lipolysis of accumulated adipose tissue (Gluconeogenesis) thereby causing abolishment of extra fat.
- It increases O₂ supply to remote tissues.
- The perspiration takes out the accumulated toxins from the body.

(14) **Chankramana²⁰:**- It is a variety of exercise which does not cause any kind of trouble to the body

- It clears the channels (srotas) of the body and increases the perceptive power of organs.

(15) **Snana (Bath):-** Daily bath improves enthusiasm, strength, appetite and removes sweat and other impurities from the body.

(16) **Sandhyopasana / Mangalakritya (Worship of Divine):-** One should remember God and do *Bhagwadsamarana* daily. One should do self –analysis of daily activities.

DISCUSSION:

Daily habits of the people makes their lifestyle .The rapid modernization has changed the lifestyle and behavioral patterns of people which is responsible for occurrence of lifestyle disorders like cervical and lumbar problems, cancer, and appendicitis on a large scale in population. The incidence of these lifestyle diseases in the past decades, has reached alarming proportions with increasing westernization of lifestyle. The management of these lifestyle disorders demands modification in faulty dietary and behavioral habits of person.

According to the science of *ayurveda*, stress should be laid upon health promotion rather than management of disease. Ayurveda provides better solution in the form of following proper *Dincharya* regimen described in *Ayurvedic* texts which promotes positive health of the individuals by maintaining normal physiological functions of the body and keeps the person healthy forever by slowing down the irreversible changes occurring in the body with the advancement of time(age).

CONCLUSION:

With the advancement of time, lot of changes has taken place inevitably in the social and religious customs and behavior and also in the mode of lifestyle of people. The *dincharya* regimen if followed properly helps to attain physical, mental and spiritual well being of an individual.

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