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ATC/DDD DIRECTED CLASSIFICATION OF FEMALE REPRODUCTIVE AYURVEDIC MEDICINES

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ABSTRACT

Ayurveda is a science of life with a holistic approach to health and personalized medicine. It is the oldest medical systems, which comprises thousands of medical concepts and hypothesis. Plants have been the basis for medical treatments through much of human history, and such traditional medicine is still widely practiced today. Public interest for the treatment with complementary and alternative medicine is mainly due to increased side effects in synthetic drugs, lack of curative treatment for several chronic diseases, high cost of new drugs, microbial resistance, and emerging diseases, etc. The present review highlights various fields of research including literary, fundamental, drug, pharmaceutical, and clinical research in Ayurveda. Fundamental research needs to be done in the fields of Ayurvedic physiology, pathology, pharmacology (fundamental and clinical), and pharmaceuticals. The fundamental research in Ayurveda caters demands of the society and the medical fraternity; the modern scientific research has been initiated in Ayurveda in the field of basic principles. The aim of basic research in Ayurveda is to explore the scientific innovations and opportunities in fundamental concepts of Ayurveda. The fundamental research includes replacement of faith and suppositions with the scientific reasoning complimented with the facts and figures. In Ayurveda, the investigation in the fundamental research are categorized into the human body (*Purusha*), the disease (*Vyadhi*), the medicine (*Aushadha*), and the right time for action (*Kriyakala*). Ayurvedic medicines are highly beneficial as they help to effectively cure our body, and also revive our mind and soul.

KEYWORDS: Reproductive System, Ayurvedic Medicines, Pharmacology, Physiology.

INTRODUCTION

Ayurveda is an ancient medical science which was developed in India thousands of years ago. Believed to have been passed on to humans from the Gods themselves. God 'Dhwanathiri' considered as the god who gives ayurveda to mankind for his health.

Ayurveda, the traditional Indian medicinal system remains the most ancient yet living traditions with sound philosophical and experimental basis. It is a science of life with a holistic approach to health and personalized medicine. It is known to be a complete medical system that comprised physical, psychological, philosophical, ethical, and spiritual health. In Ayurveda, each cell is considered to be inherently an essential expression of pure intelligence hence called self-healing science. In addition, to the self-healing concept, the use of herbal treatment is equally important in this Indian traditional system of medicine.[1]

According to the World Health Organization, about 70–80% of the world populations rely on nonconventional medicines mainly of herbal sources in their healthcare. Public interest for the treatment with complementary and alternative medicine is mainly due to increased side effects in synthetic drugs, lack of curative treatment for several chronic diseases, high cost of new drugs, microbial resistance, and emerging diseases, etc.[2]

Ayurvedic treatment is although highly effective; proper mode of action, pharmacology, pharmacokinetics, and pharmacovigilance of many important Ayurvedic drugs are still not fully explored. Moreover, the comprehensive knowledge of the basic ideologies of Ayurveda is poorly acceptable scientifically due to lack of evidence. In the modern time, when the Western medicinal system is reached almost at the top because of validated research and advanced techniques, there is an urgent need to validate basic principles as well as drugs used in the ayurvedic system of medicine with the help of advanced research methodology. Therefore, advancements in the ongoing research methodology are highly required for the promotion of Ayurveda.[3]

Classification System for Ayurvedic Medicines: History so far

Samhitas are ancient texts discovered in India and the basis of ayurvedic learning's and practices even today. Charaka Samhita, Sushruta Samhita and Astanga Hridaya are the most popular and important Samhitas in which all eight clinical branches of Ayurveda are explained together by its elementary principles.[4] Acharya Charaka in Charaka Samhita had highlighted general medicine i.e. Kaya Chikitsa whereas in comparison, Sushruta had emphasized the detailed study of surgical science (Shalya Tantra). Charak and Sushruta, Acharya Vagbhata had brought all the 8 branches of Ayurveda in limelight and had composed Ashtanga Sangraha. The compiled literature is self-sufficient to provide knowledge about all 8 branches in such a brief, easy yet defined manner. The Sushruta Samhita, along with the Sanskrit medicine related classics Atharvaveda and Charak Samhita, together explained more than 700 medicinal herbs. Sushruta classifies the medicinal plants in category of drugs as per their therapeutic use, which are named as per the herbs contain in them and not as per their therapeutic uses. These groups represent collection of herbs with similar indications. Charak Samitha grouped in several herbs under 50 mahakashyam (decoctions). For each group 10 different plants have been declared there with same mode of action and therapeutic indications. Vagbhatt has classified the herbs as per their therapeutic applications and indications which makes it little difficult to understand the classification as varied names of herbs have been used. Some current authors have attempted to classify the medicinal plants as per their therapeutic uses.[5] Priyavrat Sharma in his book "Drava-Guna Vigyan" divided the medicinal plants as per their modern pharmacological effect**.** As per ancient classification, plants were named as per the habitat, shape, size, therapeutic utility etc. In addition to it, the classification of medicinal plants in Ayurveda designed in later years does not describe binomial (*i.e.* Latin name) classification/nomenclature of plants. Nowadays modern system of plant classification grouped these herbs in several families and species of similar characteristics.[6]

Current concerns associated with modern and ancient ayurvedic classification

The index issued by WHO explains Anatomical-Therapeutic-Chemical (ATC) classification with Daily Defined Dose (DDD) along with several chemical entities to be used for different diseases/disorders. This index is comprised with two lists which specify ATC codes and hence provide all the necessary information regarding ATC classification that is up to all ATC levels. In addition to this it also describes the alphabetic index according to nonproprietary drug names. Anatomically this index is classified into 14 sub-categories which are further sub-classified and acquainted with modern drugs.[7] Though this index is an exhaustive compilation of variety of drugs to be used for wellbeing of humans yet further compilation is required to be done with respect to herbal drugs. Currently, most of the herbal drugs are not included in this classification irrespective of their reported health benefits, scientifically evidenced active ingredients along with the suspected roles of the active ingredients. The status of herbal drugs is quite unclear in recently published ATC/DDD classification. Herbal drugs are either not included or are included in significantly lesser number. The major reason behind the exclusion of these herbal drugs is that these products are not incorporated in the ordinary pharmaceuticals supply chains. Furthermore, the extent to which herbals are used in populations is largely unknown, moreover consumption data is difficult to bring together. Hence, herbal drugs are not added into ATC/DDD but have potential to cure and prevent diseases. Therefore to allow herbal drug utilization research and safety monitoring, the existing systems to capture, storage and analysis of data, needs to be adapted to lodge appropriate information on herbal products. To develop these properties of herbal medicines globally, there is a need of classification able to elaborate traditional methodology as well as their modern constituents, active ingredients that are helpful for population worldwide especially in the Western world. This article is compiled to propose a similar classification for the herbal based medicinal products used for various disorders covering neural disorders on priority. The concept of ATC/DDD's anatomical categories along with the chemical composition and supposed action of drug has been made the basis of the study and thus a compilation has been done with respect to the herbal drugs classification starting from the neural disorders in first phase and covering all other in upcoming future issues. The neural disorders are taken into consideration due to the exponential enhance in the neural diseases due to stress among population and individuals worldwide. Most of the stressed patients are either directly or indirectly relying on the herbal reparations in one way or the other. These herbal medications are being exploited by almost all the age groups for various purposes like intellect promoting, stress relieve, as well as anxiety management which are eventually the major busters of today's life style.

Ayurvedic anatomy of the female reproductive system

In Ayurvedic anatomy, 'Shroni' refers to the pelvis. Female pelvis is considered to be 24 Angulas. It is heavier as compared to the pelvis of the male. As per Ayurvedic anatomy, there are three Srotas (channels of circulation) in female's body –

- Rajovaha Srota (channels of circulation dealing with menses): They include garbasahya (uterus), cervix and yoni (vagina) along with their blood vessels.
- Artavaha Srota (channels of circulation dealing with menses): They include ovary and fallopian tube along with their blood vessels.
- Stanyavaha Srota (channels of circulation dealing with milk): They include stanya (breasts) along with its blood vessels.

'Ashaya' refers to any organ. 'Garbhasaya' means uterus and is situated behind the 'Bhagasthi' (anatomically known as symphysis pubis) and a little above the bladder. 'Yoni' is used to describe the female genital tract.

Table 1: Classification of various ayurvedic/herbal drugs/preparations used for female reproductive disorder.

S. No.	Anatomy/Acting area	Herb used
1	Prajasathapan	Druva (conch grass), Kamal (scared lotus), Kumud (indian red water lily), Kasheruk (scirpus grossus), Shringatak (singhara nut), Putrajivak
2	Contraceptives	Japa
3	Ecbolics	Ishwari (indian birthwort), Kalajaji (small fennel), Annamaya (ergotamine), Karpaas (cotton plant), Langhli (Malabar glory lily)
4	*Uterine sedative*	Sitavari, Ishwarimul
5	Emmenagogue	Ulatkambal (devil"s cotton), Vansh (thorny bamboo), Kshan (sunn hemp)
6	Anti-emmenagogue	Lodhra, Ashok
7	Galactagogue	Nall (great reed), Rohish (rusa grass)
8	Anti-galactagogue	Mallika, Arabian jasmine
9	Galactagogue purifier	Paattha (cissampelos pareira)

Comparative overview of Ayurvedic and modern classifications used female reproductive disorder

As per Sushruta, Vandhya is described as a woman having lost her Artava (menstrual fluid) which results in loss of ovulation or sterility. As per Vagbhata, the congenital malformations and deformity of female reproductive tract are possible causes of Vandhyatwa. Bhela considers aggravated vata as responsible factor for Vandhya.

Table 2: Comparative overview of Ayurvedic and modern classifications used female reproductive disorder.

Ayurvedic classification of female reproductive disease	Modern classification of female reproductive disease
Shveta Pradar	Leucorrhoea
Kashtartava	Aysmenorrhea
Anartava	Amenorrhea
Asrigdara	Menorrhagia
Yoni Vyapta	Vaginal Wyapt
Veerya Vikaras	Disorders of breast milk

Suggestive consolidations

From above event there is urgent need of improvement or modification in classification to meet the modern need. Medical text of Ayurveda have classified in Sanskrit or in regional language, this makes difficult for researcher all over the world to access, understand and interpret information. To adapt the traditional classification, WHO-HATC (World health Organization-Herbal Anatomical Therapeutics chemical Classification) has to modify or improve in traditional Classification. This can help to elaborate the functions of chemical constituent of herbal drugs with anatomically and pharmacologically in female reproductive disorder.

Table 3: ATC/DDD directed classification of Female reproductive ayurvedic medicines.

S. No.	Anatomy /Acting Area	Herb Used Common Name/Sanskrit Name/L.N/Eng.Name	Patient Sympto described by ayurveda	Therapeutic effects as per Ayurveda	Active Ingredient	Mechanism of action as per modern pharmacology
1	Female reproductive system *1.1* Prajasathapan	1.1A Druva (cynodon dactylon) conch grass	premenstrual syndrome, amenorrhea cessation of menstrual periods and affects fertility	menstrual cycle stress-induced sexual dysfunction, sexual performance, accessory sexual organ functioning	Flavonoids saponins steroid phytoestrogenic component pregnanediol	follicle stimulating hormone (FSH), luteinizing hormone (LH) was significantly decrease.[8,9]

		1.1B Kamal (nelumbo nucifera) scared lotus	Menstrual cycle	Antifertility	Ethanolic extract[10]	
		1.1C Shringatak (trapa natans) singhara nut	bleeding disorder, threatened abortion	menorrhagia, as aphrodisiac, leucorrhoea, gonorrhea	Saponins Pyridoxine hydroethanol	Increased the time span of ovulation of mature oocyte.[11,12]
		1.1D Putrajivak (putranjiva roxburghii)	Intense itching in the genital region, whitish discharge from the vagina, Spots on undergarments	Aphrodisiac, Infertility, diseases of female genital organs, leukorrhea, menstrual problems	β-sitosterol, pyranosides A-D, saponins A, B, C and D, roxburgholone, oleanolic acid	Stimulate estrogenic receptor.[13,14]
	1.2 Contraceptives	1.2A Japa (hibiscus rosa-sinensis)	Scanty menstural, Termination of pregnancy	Antifertility	β-sitosterol, taraxeryl acetate, stigmasterol	Decrease the level of estrogen and progesterone.[15]
	1.3 Ecbolics	1.3A Ishwari (aristolochia indica) indian birthwort	Prolonged menstrual phase	Antifertility, Abortifacient, anti-implantation	Aristolochic acid, Aristolactone, Aristolocheme	Hyperpermiability of the endometrium capillaries, increase uterine weight.[16]
		1.3B Kalajaji (nigella sativa) small fennel	Vaginal dryness, Breast tenderness, Emotional change	Uterotropic, Vaginotropic, Improving reproductive response	Thymoquinone, Nigellone, Carvone, Thymol	Increase serum estradiol, Vaginal cell cornification.[17,18]
		1.3C Annamaya (claviceps purpuea) ergotamine	Stemmed bleeding during childbirth, Menstrual bleeding, Postpartum bleeding	Uterine contraction, Resulting in abortion, Reproductive performance, Prolactin secretion	Ergoline, Ergonovine, Ergine, Ergopeptines	Increase smooth muscle tone to contract (uterine contraction).[19,20]
		1.3D Karpaas (gossypium herbaccum) cotton plant	Labor induction, Bleeding, menstrual pain, Menopausal symptoms	Abortion, Gonorrhoea, Vaginal contraceptive,	Steroid, saponin, phenolic compound, gossypupurin, sitosterol, ergostoreol	Suppression the secretion of FSH and LH through negative feedback inhibition.[21,22]
		1.3E Langhli (gloriosa superba) Malabar glory lily	Labor induction, menstrual pain	Antifertility, Uterotonic, abortifacient	Colchicine, lumiColchicine, superbin, gloriosine	Smooth Muscles relaxant properties.[23]
		1.3F Harmal (paganum harmala) Syrian rue	Prolong menstrual cycle	Abortificient	Vasicine, vasicinone,	Decrease follicular stimulating hormone.[24,25]
	1.4 Uterine sedative	1.4A Sitavari	Irregular menstrual bleeding, post-menopausal symptoms	Uterine tonic, fertility enhancer, nourishes the womb and ovum, preparing female organs for pregnancy, prevent	Sarsasapogenin and shatavarin, isoflavone, racemosol and kaempferol	responsible for the competitive block of oxytocin induced contraction, block Pitocin sensitive receptor, increase growth of mammary glands, alveolar tissue.[26,27]

				miscarriage, aphrodisiac		
		1.4B ishwarimul (Terminalia Belerica)	Severe bleeding, cramping, perforation of uterine wall	anti-implantation activity, blastocytotoxic	Phytosterols, flavanoids, phenolic compounds, tannin	Inhibiting oxytocin receptor.[28]
	1.5 Emmenagogue	1.5A Ulatkambal (abroma augusta) devil"s cotton	Excessive bleeding, pelvic pain during menstruation,	increases menstrual flow, gonorrhoea, , dysmenorrhoea	Taraxerol, Lupeol	Decrease the oxytocin receptor over expression im myometrial smooth muscle.[29,30]
		1.5B Vansh (bambusa arundinacea) thorny bamboo	changing uterine milieu, vaginal cornification, changes in uterine endometrium	Antiovulatory, estrogenic activity	Saponins, coumestans, isoflavones, lignans, stilbens	inhibit pregnancy by suppressing the level of both follicular stimulating hormone and luteinizing hormone, prevent the implantation by losing fibrous tissues with stimulated uterine glands.[31,32]
		1.5C Kshan (crotalaria juncea) sunn hemp	premature cornification of the vaginal epithilium	developing follicles, Graafian follicles, antiimplantation	Petroleum ether, benzene alcohol	involving the nitric oxide pathway in the trophoblast.[33]
	*1.6*Anti-emmenagogue	1.6A Lodhra (symplocos racemosa)	Menstrual cycle discomforts	Menorrhagia, Polycystic ovary syndrome, uterotrophic	Flavonoids, phytosterols, saponins, glycosides,	Reducing oxidative stress, preventing reactive oxygen species.[34,35]
		1.6B Ashok (saraca asoca)	menstrual bleeding	Menorrhagia, gonorrhea	phenols, flavonoids, glycosides, diterpenes	inhibitor of prostaglandin synthesis or an antagonist to progesterone action.[36]
	1.7 Galactagogue	1.7A Nall (arundo donax) great reed	–	–	donaxarine, bufotenine, gramine, indole-3-alkayalamine	no information
		1.7B Rohish (cymbopogon citrus) lemon grass	vaginal bleeding, vaginal dryness	vaginal atrophy, uterine fibroids,	Polyphenol, tannins, flavonoids	Inhibit oxidative stress in erythrocytes of women on postmenopausal period.[37,38]
	1.8 Anti-galactagogue	1.8A Mallika (jasminum sambac) Arabian jasmine	labor pain, stopping uterine bleeding,	Aphrodisiac, breast cancer, uterine tonic	Linalool, jasmone, cadinol, β-elemene	Activate melanocortin receptor.[39,40]
	1.9 Galactagogue purifier	1.9A Paattha (cissampelos pareira)	–	Antifertility, inhibiting embryo implantation, increase prolactin, Breast cancer, cervical cancer	Berberine, tetrandrine, methanolic extract, cissamine	Block D2 receptor, stimulate prolactine secretion.[41,42]

CONCLUSION

Herbal products have become an important and indispensable part of public healthcare around the world. Various surveys on traditional and alternative medicine have highlighted their widespread use. However, in order to further widen their forum of acceptance, clinical

trials/pharmacological activity of these herbal products should be encouraged, to prove better classification of herbal drug. The understanding of the disease, and hence the disease criteria can be different in herbal and modern medicine approach. Therefore, it becomes difficult to define inclusion and exclusion criteria and hence to generate a homogenous group of subjects as per the diagnosis of herbal medicine. For this case, "double classification method" introduced where subjects are primarily diagnosed using modern diagnostic criteria and then are classified according to the traditional system. Treatments are given according to traditional classification and outcomes are evaluated by criteria for both the systems. The Herbal ATC system (HATC) presented guidelines that provide a unique scientific framework for a harmonized, global nomenclature and therapeutic classification of herbal substances and combinations of them.

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