Review Article

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A Brief Review of Research Studies Conducted on Panchavalkal

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Abstract

Panchavalkal is the formulation with barks of five trees viz. *Vata* (*Ficus benghalensis* Linn), *Udumbara* (*Ficus glomerata* Roxb.), *Ashwatha* (*Ficus religiosa* Linn.), *Parish* (*Thespesia populnea* Soland ex corea.) and *Plaksha* (*Ficus lacor* Buch-Ham.). This polyherbal formulation showed in-vitro antimicrobial activity which supports the activity mentioned in Ayurved classics as effective in *Vrana* (wounds) as well as *Shotha* (inflammations). These five herbs have the potential for *Vrana Shodhan* and *Vrana Ropan* properties due their *Kashaya* (astringent) rasa predominance. The aim of this review article is to highlight the uses and potential of *Panchavalkal* for management of inflammation, wounds, antiseptic and antimicrobial. The data related to the *Panchavalkal* has been collected by hand search and through the internet which was published in the scientific journals. The studies carried out on *Panchavalkal* are preclinical as well as clinical studies. This article gives direction to the new researcher for further study on *Panchavalkal* for its antimicrobial activity in different forms.

Keywords: Antimicrobial; Anti-inflammatory; Ayurveda; *Panchavalka; Shotha; Shodhan, Ropan; Vrana;* Wound healing.

Introduction

In Ayurved *Panchavalkal* (five plant bark viz. Vata or *Ficus bengalensis*, Udumbar or *Ficus glomerata*, Plaksha or *Ficus infetoria*, Ashwathha or *Ficus religiosa* and Shirisha or *Albizzia lebbek*) is mentioned in the treatment of *Vranashotha* (inflammations and abscess) and *vrana* (wounds).

Vata (Ficus bengalensis): Phytochemical investigation of various extracts of *F. benghalensis* Linn. Stem bark indicated the presence of alkaloids, flavonoids, steroids, phenolic compounds and tannins. Author concluded that various parts including stem bark of *F. benghalensis* Linn. is also used as astringent, haemostatic, anti-inflammatory and antiseptics [1].

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Udumbar (Ficus glomerata): The ethanol extracts of *F. glomerata*. Linn (Moraceae) bark and leaves were studied for antiulcer activity against aspirin plus pylorus ligation-induced gastric ulcer, HCl-ethanol-induced ulcer, and water immersion stress-induced ulcer in rats. These plant extracts attenuated the gastric volume, free acidity, total acidity, and ulcer index. They also reduced the gastric lesion induced by HCl-ethanol mixture and showed protection against water immersion stress-induced ulcers [2].

Laksha (Ficus infetoria): A feeding trial was conducted to study the effect of tannin rich Plaksha (*Ficus infectoria*) leaves on microbial profile, rumen fermentation and nutrient utilization in goats. Eight goats divided in two groups were fed Plaksha leaves (experimental group) and green oats (control group) as sole roughage source along with a fixed quantity of concentrate mixture for a period of 3 months. The number of cellulolytic bacteria also significantly ($p<0.05$) reduced in the animals fed Plaksha leaves as compared to control. The number of tannin degrading / tolerant bacteria increased tremendously in goats fed Plaksha leaves as compared to the control goats fed green oat [3].

Ashwathha (Ficus religiosa): The wound healing activity (incision and excision model) of *Ficus religiosa* leaf extract prepared as ointment form (5 and 10%) was investigated. Povidone iodine 5% was used as

standard drug. The healing of wound was assessed by the rate of wound contraction, decreased in the period of epithelialization, high skin breaking strength was observed in animals. 10% ointment of *Ficus religiosa* leaf extract shows better wound healing activity than 5% concentration [4].

Parisha (Thespesia populnea Soland. ex Correa): The ethanolic extract of *Thespesia populnea* bark (TPE) was investigated for anti-inflammatory and analgesic activity at the doses (p.o.) of 100, 200 and 400 mg/kg body weight. For evaluation of inflammation carrageenan-, histamine- and serotonin-induced paw edema served as acute models and formaldehyde-induced arthritis served as a chronic model in rats. The acetic acid-induced writhing response and formalin-induced paw licking time in the early and late phases of mice were used to assess analgesic activity. The higher doses of TPE (200 and 400 mg/kg, p.o.) were inhibiting carrageenan, histamine and serotonin-induced paw edema as well as formaldehyde-induced arthritis successfully. In addition, TPE (200 and 400 mg/kg, p.o.) significantly attenuated the writhing responses induced by an intraperitoneal injection of acetic acid and late phase of pain response induced by an subplantar injection of formalin in mice. Furthermore phytochemical studies indicated that the ethanolic extract of bark contains alkaloids, carbohydrates, protein, tannins, phenols, flavonoids, gums and mucilage, saponins and terpenes. From acute oral toxicity studies (OECD-423 guidelines), no mortality was observed even at highest dose of TPE (2000 mg/kg, p.o.) [5].

All the ingredients present in the *Panchavalkal* has *Kashya rasa* (Astringent properties) which helps in the *Shodhan* (cleansing) of *Vrana* [6]. *Panchavalkal* (the barks of five plants) has activities like *Vrana prakshalana*, *Vranaropana*, (wound healing), *Shothahara* (anti-inflammatory), *Upadanshahara* (useful in gonorrhea) and *Visarpahara* (erysipelas). [7-11]. All the ingredients of the *Panchavalkal* have *Kashaya rasa* predominant, *Guru* and *Ruksha Guna*, *Sheeta Veerya* and *Katu Vipaka*. The properties mentioned in the classic in all individual drugs have *Shothahara*, *Vedanasthapan*, *Vranaropak*, *Stambhana*, *Raktashodhak,* etc. Individual ingredients of *Panchavalkala* were studied for their phytochemical properties and found active principals which are helpful for the inflammation and healing of wounds so combine property is also said to be antimicrobial action. In Ayurveda text these ingredients are helpful in the *Shodhan* and *Ropan* of wounds and *Shothahar* properties. The individual ingredients of *Panchavalkal* also tested for their antibacterial activity in the research studies.

Materials and Methods

The aim of this article is to summarise the research studies conducted on *Panchavalkal* in the different forms like extract, gel, ointment, douche, *Kwath* etc as preclinical and clinical. For that purpose the search was done on internet by search engine Google, Pubmed, Ayurved Research database like Ayush portal, Digital helpline for Ayurveda Research Articles (DHARA) [12-15]. The search in above site was done by keyword *Panchavalkal* and following articles were found in different sites. Some of article or post graduate research studies were made available by hand search as possible.

Results

The research studies carried out on *Panchavalkal* were presented here as preclinical and clinical studies. These studies have been shown the methodology adopted, result and conclusion of the respective studies.

Antimicrobial study of Panchavalkal

Antimicrobial activity was carried out to evaluate the efficacy of extract *Panchavalkal* as skin disinfectant against staphylococcus aureus (gram positive), Escherichia coli and pseudomonas aeruginosa (gram negative), candida albicans fungi. These four organisms are likely to be present on skin surface. Diffusion method as per Kirby-Bauer was employed to study the antimicrobial activities of test drug. After incubation for 24 hours at 37oC plates were observed for the zone of inhibition (mm). The study concluded that extract of *Panchavalkal* showed more antimicrobial activity than individual ingredients of *Panchavalkal* [16].

Antimicrobial activity of phytoconstituents of Panchavalkal

The phytoconstituents from *Panchavalkal* were extracted and detected by various qualitative chemical tests. It was mainly found to contain phytosterols, tannins and glycosides. These phytoconstituents were isolated by chemical methods and then tested for antimicrobial activity against various gram-positive, gram-negative and fungal cultures. It was observed that tannins had the best antimicrobial activity in comparison with glycosides and phytosterols [17].

Anti-inflammatory and free radical scavenging activity of Panchavalkal

In the present study, preliminary phytochemical testing of *Panchavalkal* showed the presence of high amount of tannins and phenolics in all the samples. Subsequent quantification revealed that the total phenolic content ranged from 3.5 to 10.8% w / w and the total tannin content ranged from 1.6 to 7.0% w / w in the samples. The presence of high amount of phenolics and tannins and the above reasons prompted to study the free radical scavenging activity of *Panchavalkal* and its individual ingredients. From the above experiments it is clear that *Panchavalkal* and its components showed good free radical scavenging activity which can be attributed to tannins and phenolics along with other compounds. Free radical scavenging activity could be one of the mechanisms of action of *Panchavalkal*, including its anti-inflammatory activity [18].

In vitro antibacterial activity of Panchavalkal

The study aimed to screen the alcoholic extract of *Panchavalkal* for in vitro antibacterial activity against MRSA (clinical isolates reported to be resistant to Gentamicin, Norfloxacillin, Penicillin G, Benzyl Penicillin, and Cefotaxamine; susceptible to Clindamycin). The barks were evaluated as per Ayurvedic Pharmacopoeia of India and then powdered. The powder was evaluated and alcoholic extract prepared by Soxhlet extraction. Standardized extract was evaluated for the antimicrobial activity reported here. A number of gels, intended to be used topically in wound infections were formulated and the best was evaluated for antimicrobial activity against MRSA using cup plate (agar well-diffusion) technique. The herbal extract and gel were found to be effective. The results demonstrated that *Panchavalkal* could represent a source of antimicrobial agents, for the control of MRSA wound infections [19].

Antibacterial activity of Panchavalkaladi ointment

The purpose of the present study was to prepare an Ayurvedic ointment comprising of Panchavalkala and Triphala and to evaluate the anti-bacterial activity and to screen its wound healing property. In current study the anti bacterial activity of the trial drug was carried out by agar diffusion method. The response of organisms to the trial drug was measured and compared with the response of the standard reference drug Streptomycin (5mg w / v) was used in the study. Anti bacterial activity of the trial drug was evaluated in the specified organisms like Escherichia coli, Staphylococcus aureus and Streptococcus pyogenes. Screening of wound healing activity showed that the *Panchavalkaladi* ointment enhanced the process of wound healing [20].

Panchavalkal as antiseptic gel

The study was planned to prepare an Ayurvedic hand sanitizers incorporating *Panchavalkal*, to evaluate their respective antimicrobial activities. The present study is an attempt to convert Ayurvedic formulation (*Panchavalkal Kwatha*) into a ready to use antiseptic gel, which can be used as hand wash. The study showed that the gel hand wash of *Panchavalkal* has anti bacterial activity particularly against B. pumillus and S. aureus at minimum concentration of 400mcg / ml. The *Panchavalkal* has been attributed with properties like free radical scavenging, antihelminthics antimicrobial, anti-inflammatory and analgesic. Study concluded that results were insignificant with antiseptic liquid, but Gel hand wash showed encouraging results in culture sensitivity [21].

Physico-chemical study of Panchavalkal Gel

The study was planned to prepare herbal wound healing gel from *Panchavalkal* barks, Nimba bark (*Azadirechta indica* A. Juss) and Kumari leaves (*Aloe vera* Linn.). Total five batches were prepared to develop the SMP after preparing many trial and errors. Raw drug samples, in process i.e. *Kwatha* and *Swaras* and finished product i.e. Gel, were compared on physicochemical parameters i.e. pH (between 6 and 7), loss on drying (between 94 and 95), water soluble extractive value (between 5 and 6), alcohol soluble extractive value (between 4 and 5) etc. Qualitative tests reveal presence of tannin, phenols and saponin in Gel. HPTLC profile shows some comparable picks among in process and Gel samples indicates presence of some similar compounds [22].

Panchavalkal capsule as in prophylaxis for major gynaecological surgeries

Pentaphyte-P-5, an antimicrobial agent of Ayurvedic origin, was studied for its effectiveness in prophylaxis for major gynaecological surgeries. The composition of capsule are *Panchavalkal* extracts from barks of five plants *Ficus Bengalensis, Ficus Religiosa, Ficus Glomerata, Ficus Infectora* and *Albizza Lebeck.* (Formulated by Dr. Palep's Medical Research Foundation).

Patients were administered capsule Pentaphyte-P-5 in a dose of one capsule four times a day-three days prior to surgery followed by the same dose from second post operative day. No antibiotics were given on the day of the surgery. This regimen was continued up to the time of discharge from the hospital. The results obtained were compared with patients in three different control groups i.e., one group receiving no antibiotics at all, second group receiving antibiotics plus Pentaphyte-P-5 and the third receiving the routine antibiotics such as ampicillin or cipro oxcin with metronidazole and gentamycin. The post operative results of the study group were evaluated. These were compared with similar studies conducted for use of Ciprofloxacin and Augmenting for prophylaxis in major gynaecological surgeries.

Panchavalkal capsule can thus be recommended as a wide spectrum prophylactic anti-microbial agent. It is cheap and does not require expensive imported raw materials for its production. It has the convenience of single drug, oral route, simple dosage schedule as against multiple antimicrobials required to be used parenterally. It has no side effects of GIT irritation and this ensures good patient [23].

Panchavalkal douche in leucorrhoea

The use of cytology, vaginal pH and colposcopy as adjuvant to clinical assessment of efficacy of *Panchavalkal* douche in the treatment of uncomplicated leucorrhoea was evaluated in 42 patients of leucorrhoea. In this study, *Panchavalkal* douches for 14 days provided symptomatic relief in 15.7% cases of uncomplicated leucorrhoea ($P<0.001$). Cervical cytology, vaginal pH and colposcopy were utilized in confirming its anti-inflammatory and antimicrobial effects. Cytology was very useful in assessing the severity of infection and in identifying some specific infections. Author concluded that on the basis of these investigations *Panchavalkal* douches play key role in the treatment of uncomplicated leucorrhoea [24].

Puerperal sepsis, cervical erosions and vaginal infections are very common problems in women. Various vaginal douches are recommended and practiced traditionally. Among these douches *Panchavalkal* douche has been studied, recently in-group of patients with leucorrhoea and showed significant symptomatic relief [25].

Panchavalkal ointment in Vulvovaginitis

The study was planned to find efficacy of *Panchavalkal* ointment in vulvovaginitis during pregnancy. Total 50 cases of vulvovaginitis were selected and divided into two groups; one group treated with Panchavalkal ointment and another with trim ovate ointment. Patients were assessed by weekly interval on the basis of symptomatic relief and absence of pathogens in wet slide study and vaginal swab culture. The study concluded that *Panchavalkal* ointment is more effective against Trichomonas Vaginalis and E. Faecalis in comparison to Triclovate ointment [26].

Panchavalkaladi Varti in Upapluta Yonivyapad (Vulvovaginitis)

In Ayurveda *Upapluta Yonivyapad* with *Vata Kapha* vitiation can be correlated with valvovaginitis which is most common condition of bacterial, fungal and T-vaginalis infection seen during pregnancy. In this clinical trial, patient of first trimester with age group between 19 to 40 years of age suffering from Valvovaginitis were selected and divided into two groups. In group-A (n=27) *Panchavalkaladi* varti and in group-B (n=25) Trida suppositories (clotrimazole 200mg, Tinidazole 500mg, Lactic acid bacillus-150) were inserted in birth canal for 15 days. The study concluded that *Panchavalkaladi varti* provided better relief than Trida Vaginal suppositories in relief of symptoms like yoni *srava, kandu, daha, pichchilata, vedana* and *daurangdha* [27].

Panchavalkal douche in chronic cervicitis

Total 36 diagnosed patients of *Karnini Yonivyapad* (Chronic cervitis with erosion) were divided into 3 groups; In group A (n=10) patients treated with *Panchavalkal kwath* (Nyagrodha, Udumbara, Asvattha, Sirisa and Plaksa) prepared with 200 gm *Kwath Churna* and mixed with *Sphatika* (8gm) in the form of vaginal douche. In group B (n=16) patients treated with *Kasisadi taila Pichu* (Bhaisajaya Ratanavali, Arsorogachikitsa / 204-206) 10 ml twice a day. In Group C (n=10) patients were treated with *Pichu* and vaginal douche both. In all 3 groups treatment started from 6th day of menstrual cycle and was carried out for 45 days. Overall relief in symptoms was 52.72%, 67.43% and 75% in group A, B and C respectively. Study concluded that *Panchavalkal* douche along with *Kasisadi taila Pichu* had more effective. Hence from this study it can be said that there is definite role of *Panchavalkal* as an anti inflammatory and healing action in cervitis or cervical erosions [28].

Panchavalkal in Vranashodhan and Vranaropan

Concept of Ayurveda holds good only due to use of holistic medicinal plants from huge biological diversity like India, since 5000 years ago. The rich biodiversity of India constitutes so many plant varieties but Ayurveda utilizes number of plants for wellbeing of mankind among that Triphala is the best with properties like *vrana shodana, chakshusya, virechak*. Like *Trikatu, Dashamula, Pancha Pallava*, *Panchavalkala* etc. medicinal plants which are mentioned in Ayurvedic classics are helpful to relieve ailments from mankind. *Panchavalkal* is useful in *Vranashodhan* and *Vranaropan* in different forms in Ayurveda practices [29].

Panchavalkal kwatha in Fistulotomy wound

The study planned with objective to evaluate and compare the efficacy of *Nishadya taila* and *Panchavalkal Kwatha* in *Bhagandar Vrana* (Fistulotomy wound). For that purpose 90 patients suffering from *Bhagandar Vrana* were selected and divided into 3 groups. In group-I (n=30) *Nishadya Taila* applied locally once daily; in group II (n=30) patients were treated by the cleaning of wound with *Panchavalkal Kwath* once daily and combined treatment *Nishadya Taila* and *Panchavalkal Kwath* was prescribed in group III (n=30). The percentage wound healing was 76.14%, 70.62% and 82.96% in group-I, II and III respectively. Hence it can be supposed that *Panchavalkal Kwath* had *Shothahara* and *Ropan* properties in *bhagandar Vrana* without adverse effect [30].

Wound healing activity of Panchavalkal Ghanasatva

Patients of chronic non-healing ulcer were selected for study and divided into two groups. In group A (n=15) collagenase enzyme and chlorine water as local application while in group-B (n=15) 25% aqueous extract of *Panchavalkal Ghanasatva* for local application. Assessment of relief in sign and symptoms was done fortnightly up to 60 days. It was observed that *Panchavalkal* application reduces pain and discharge along with *Shodhan* and *Ropan karma* of chronic ulcers. Finally study concluded that classical prepared *Panchavalkal Kwath* has less effective but 25% aqueous extract of *Panchavalkal Ghanasatva* has shown well antimicrobial action [31].

Wound healing activity of Panchavalkala Siddha Shatadhauta Ghrita

Shatadhauta Ghrita and *Panchavalkala Siddha Shatadhauta Ghrita* have been studied for their shelf life and wound healing activity. Shelf life of SDG was observed to be 9m and of PSSG to be 6m respectively. The animal experimentations validated excision wound healing activity of the test formulations, the difference of which was statistically insignificant. Randomized clinical trials on 43 patients were conducted. Group-A received *Panchavalkala Siddha Shatadhauta Ghrita* (PSSG), Group-B received *Shatadhauta Ghrita* (SDG) and Group-C received Povi-Iodine. Fresh wounds of less than 5cm area were included in the study. The percentage cured was 92.86%, 71.42% and 40% in Group-A, B and C respectively. Overall result showed 67.44% of the patients were cured, 18.60% patients with marked improvement and 13.95% moderate improvement. Study concluded that the *Panchavalkal* has definite potential in wound healing [32].

Panchavalkal Lepa in Acne Vulgaris

Mukhadooshika is one of the skin disease described in Ayurveda under the *Kshudra Roga*. It is primarily seen on face according to Sushruta and Vaghbata and is having parlance with acne vulgaris in modern dermatology [33-34]. The study planned with aim to evaluate the efficacy of *Panchavalkal Lepa* locally along with *Panchavalkal Kashaya* orally in *Mukhadooshika*. The selected patients were divided into two groups; in group A (n=15) *Panchavalkal Lepa* applied locally on face once daily. In group (n=15) *Panchavalkal Lepa* applied locally along with *Panchavalkala Kashaya* 20ml orally twice daily. The duration of treatment was 30 days. The ingredients of *Panchavalkal* have the properties like *Kapha-Vata Hara, Varnya, Vrana Ropana, Rakta Shodhaka* and these properties helped to relief in acne in this study. After completion of study encouraging results were observed and study concluded that *Panchavalkal* had *Shodhan* and antibacterial properties [35].

Pharmacognostical and Phytochemical standardization of Panchavalkaladi varti

Pharmacognostical and Phytochemical standardization of *Panchavalkaladi varti* was carried out at IPGT&RA, Jamnagar. Qualitative test for various functional groups revealed the presence of tannins, alkaloids, flavanoids, saponin glycosides; steroids, reducing sugars, and volatile oil. The study concluded that the identified phytochemical components like Tannins, Anthraquinones, Phytosterols all are astringents and anti-inflammatory, thus reduce the discharge, pain, tenderness, redness, swelling leading to quicker epithelialization. It is inferred that the formulation meets minimum qualitative

standards as prescribed by API at preliminary level. The results of this study may be used as the reference standard in further research undertakings of its kind [36].

Conclusion

Panchavalkal is routinely used plant in Ayurvedic medicine for local and systemic also. It is one of the most versatile plants having a wide spectrum of medicinal activities. The review shows the *Panchavalakal* has presence of tannins, alkaloids, flavanoids, saponin glycosides; steroids, reducing sugars, and volatile oil. On the basis of this it has antimicrobial activity so used in the gynecological disorders like leucorrhoea, cervicitis, valvovaginitis and prophylaxis in gynecological surgeries in the form douche, *Varti,* ointment and capsules. Hand wash gel of *Panchavalkal* can be used for antiseptic, *Kwath* for pre operative skin preparation in shalya discipline. The *Kwatha* and ointment is used in cases of non healing ulcers as *Panchavalkal* has anti-inflammatory and wound healing activity. *Panchavalakl* can also be used in acne vulgaris. The reported studies showed that Panchavalkal have very good wound healing activity. Hence, it can be said that *Panchavalakl* has good potential and need to create the evidence based data in more numbers of patients for its validation in clinical practice. The review study definitely will be helpful to the new researchers for further clinical study for its validation.

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