Computation and comparison of the drug efficacy indices [Q(VPK)] of certain ayurvedic foot care formulations

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ABSTRACT

Aim: The medical science Ayurveda being one of the oldest system of alternative medicines have its own well studied philosophy rooted to Vedic age and in a unique way the great Indian Rishis the very founders of Ayurveda observed the nature and developed many simple but fruitful formulations to cure various ailments for the sake of the entire human society. The present study aims to predict theoretically the efficacies of certain Foot Care Ayurvedic formulations including the modern patented and proprietary medicines by computing their respective Drug Efficacy Indices. Method: The efficacies of certain classical as well as proprietary Ayurvedic Foot care Formulations were theoretically calculated using a simple mathematical formula computed based on traditional and fundamental principles of Vedic Ayurveda. Results: The Drug Efficacy Indices of the selected formulations were numerically computed using an equation based on the dravyaguna vingnaneeya and categorized to corresponding pharmacological groups. Apart from these certain foot care formulations were theoretically designed using the developed computational methods and their corresponding Drug Efficacy Indices were computed and compared. Conclusion: The present study categorized the commonly used Foot care formulations according to their pharmacological activities. The present study also showed the practical application of Computer Aided Drug Designing (CADD) of two foot care formulations based on the classical principles of Ayurveda by effective incorporation of modern concepts like Artificial Intelligence to the most fruitful and simple manner.

Keywords: Alternative medicines, Ayurvedic Foot Care Formulations, Drug Efficacy Index [Q(VPK)], Computer Aided Drug Designing (CADD).

INTRODUCTION

The system of Ayurveda provides various formulations for treating almost all kind of diseases that have high therapeutic values and also found rich with many cosmetics. Suitable incorporation of the recent developments of modern technology gave birth to various modified forms of many classical Ayurvedic formulations like ointments and creams. It is wonderful to believe that many recent market surveys showed the increased need of such products due to the modern look as well as their claimed therapeutic values. Most of these recent formulations belong to the proprietary medicines and some claim even their textual authority by citing the text Sahasrayoga which have various unpublished editions that have to be seriously observed. This present study concentrates on computing and predicting the efficacy indices of certain classical foot care formulations and new generation Ayurvedic formulations that can be effectively used for treating different foot problems like different allergies, cracking, rough feet etc. The Alternative system of Ayurveda classifies such ailments to many kinds of Kushtha the skin disorders.

The skin disorders Kushtha: According to Ayurveda the diseases are due to the vitiation of doshas the somatic humors. Similarly the skin diseases termed Kushthas were classified scientifically according to the nature of the vitiation of all the three doshas with a predominantly vitiated one, two or the all thus arising seven types. In Madhava Nidana the different causes of various skin disorders are well explained and classified [1,2,3,4]. From the samhitas the texts it is further evident that there is no skin disorder that is caused by vitiation of only one dosha among the three and these skin disorders of various types having similar etiological source show difference in pain, color, symptoms, effects, name and treatment according to proportional variation, association and location of doshas that are vitiated.

The Ayurvedic Etiology and Diagnosis of Kushtha: According to Ayurvedic samhitas the following are the etiological factors for skin disorders viz. incompatible food habit, habitually having unctuous and heavy substances, suppression of the natural urges (particularly of vomiting), exposure to physical exercise and/or intense heat after gormandizing, having cold, hot, lightening measures and diet against the prescribed order, application of cold water immediately after intense exposure to the sun, exertion or fear, gormandizing during indigestion and especially when the previous meal is not properly digested,
having contraindicated items while undergoing pancakarma therapy, having contraindicated food items together like new cereals, curd, fish, salt and sour substances etc., intercourse during indigestion, sleep regularly during the day, indulging in sinful activities like insulting the Brahmanas, teachers (and other respectable persons) etc. The Ayurvedic diagnosis considers that all types of Kushta are caused by the three doshas together, so the predominance or minimal role of each dosha must be determined from the respective symptoms very carefully. The diagnosis uses the unique ways to determine the consequent primary dosha involved in the disorder. The primary dosha/type can be determined both ways either the dosha inferred from the type of skin disease present (Retro diagnosis) and the skin disease type may be inferred by the doshas involved (diagnosis). It is also possible from the etiological factors collected from the oral narration of the patient (oral history) under treatment. The effective combination of these three methods viz. diagnosis, retro diagnosis and oral history will enhance the processes for prescribing effectively. The Vata predominant skin disorders have characteristic roughness, wasting, pain (piercing or other types), contracture, extension, hardness, coarseness, colour (blackish and reddish) etc., the Pitta predominant have characteristic heat, redness, various discharge, suppuration, characteristic smell (fleshy), moisture, falling down of organs etc. and the Kapha predominant skin disorders have characteristic whiteness and coldness, itching, stability, raising, heaviness, uncouthness etc. The prognosis suggests that if all symptoms are present, plus debility, thirst, burning sensation, loss of appetite etc. the skin disorder might be incurable and reject without treating. The skin disorders or Kushtas that are predominant in Vata-Kapha nature or any single dosha can be easily curable ones and those predominant in Kapha-Pitta or Vata-Pitta are found difficult. Any curable skin disorder may change to incurable due to neglect or not properly treating. The skin disorders can be effectively cured by selectively treating the most aggravated dosha first, followed by the secondary doshas.

Materials And Methods

Here in this paper a common skin disorder namely Vipadika a Vata-Kapha type minor skin disorder that causes tearing of especially the foot with excessive pain is taken and the efficacies of various foot care creams including marketed Jivantyadi Yamaka and the classical formulation called Jivantyadi Yamaka were computed and compared.

The Jivantyadi yamaka (JY): This is a classical formulation explained in various Samhitas for treating the minor skin disorder called Vipadika (Vata-Kapha) that also recommended remedy for other non leprosy minor skin disorders like Carmakhyya (Vata-Kapha), Ekakustha (Vata-Kapha), Kitihiba (Vata-Kapha) and Alasaka (Vata-Kapha). It contains the ingredients Jivanti, Manjistha, Daruvaridra, Kampiliaka (dust), Arkaksheera, Ghrtam, Tailam, Sarjarasa, Madhucchishta(Bee’s Wax) and Tutha. This is one among the best formulations with high therapeutic values since the age of Caraka Samhita the oldest Ayurveda text available. The parts percentages are very clearly and specifically given authentic texts with great importance. The formulation is marketing by many pharmaceuticals with different combination quoting the classical texts as their references. For computing the Drug Efficacy Indices the parts percentages of the components of the marketed formulations as stated by the manufacturer were taken. The computed values were compared with that of the classical formulation (Jivantyadi Yamaka) as per the part percentages mentioned in authentic texts.

Amrut Malam (AM): This is a modern Ayurvedic proprietary medicine manufactured by Amrut Pharmaceuticals, Belgaum. The manufacturer claims that it is useful for the cracks on heels, foot toes, hand, lips and skin due to cold. It is also recommended for the disorders like chapped lips, burning sensation in palms and soles, itches, dryness of the skin, weeping or dry skin diseases, cuts, wounds, burns of acid or fire, athlete’s foot etc. This proprietary medicine contains Garcinia indica, Ricinus communis, Cinnamomum camphora, Talc, Gandhaka, Mentha spicata, Zinc oxide and oil base colour.

Krack Heel Repair (KHR): This is a modern Ayurvedic proprietary medicine manufactured by Paras Pharmaceuticals Ltd., Ahmedabad. The manufacturer claims that it is a specialist heel care cream which uses healing power of seven herbs that moisturizes, heals and soothes the affected area when applied. It is recommended for the treatment of dry skin disorders such as cracked heels, chapped hands, fissures and chilblains. It is also helpful for treating minor burns, cuts and wounds. It contains the kwath processed oil derived from Pitadaru, Kampiliaka, Pashanabhedha, Manjistha, Payasvini, Sarjarasa, Grrta and Sasyaka. In addition it also contains Vrkhshamala and base to make with other approved excipients.

Himalaya Foot Care Cream (HFCC): It is an Ayurvedic proprietary medicine manufactured by Himalaya Drug Company, Bangalore. This is claimed that the formulation is an effective relief from dry, cracked heels and rough feet. It can give deep moisture for soft and smooth feet. Manufacturer refers the API Bhava Prakasha a classical text. The formulation contains Honey, Curcuma longa, Shorea robusta, Zinger officinalis and Trigonella foenum-graecum. The added inactive constituents are Methylparaben IP, Propylparaben IP and Bronopol IP.

Herbal Heel Healer (HHH): This is a prescription given in the text published by Divya Sansthan, Haridwar. This contains Sarshapatai Tailam, Madhucchista and Karpura that can be used for the dry and rough heel.

Herbal Foot Heal-1 (HFH-1): This is a designed herbal formulation for external application suggested based on the traditional knowledge in view of the modern computational methods for the treatment of the minor skin disorder called Vipadika (Vata-Kapha) and other non leprosy minor skin disorders like Carmakhyya (Vata-Kapha), Ekakustha (Vata-Kapha), Kitihiba (Vata-Kapha) and Alasaka (Vata-Kapha). It contains the ingredients Sarshapatalam, Madhucchishta, Karpura, Darvi and Grrta as the base with specific and fixed compositions.

Herbal Foot Heal-2 (HFH-2): This is another designed herbal formulation for external application suggested based on the traditional knowledge in view of the modern computational methods for the treatment of the minor skin disorder called Vipadika (Vata-Kapha) and other non leprosy minor skin disorders like Carmakhyya (Vata-Kapha), Ekakustha (Vata-Kapha), Kitihiba (Vata-Kapha) and Alasaka (Vata-Kapha). It might be useful for other minor skin disorders like Dadru (Kapha-Pitta), Carmadala (Kapha-Pitta), Pama (Kapha-Pitta), Visphota (Kapha-Pitta) and Sataru (Kapha-Pitta). It contains the ingredients Sarshapatalam, Madhucchishta, Karpura, Darvi, Grrta, Jivanti, Sarjarasa and Vrkhshamala with specific and fixed compositions.

Experimental

The respective drug efficacy indices the measures of the pharmacological activities of all the above formulations were computed using the formula (Figure 1).

\[ Q_{(VPK)} = \sum_{i=1}^{n} q_{i} / 100 \]

Where \( Q_{(VPK)} \) is the Drug Efficacy Index, VPK represents Vata, Pitta and Kapha respectively and \( q_{i} \) is the individual components for the Vata,
Pitta and Kapha respectively. The Π represents the Prabhava the corrective entity that can effectively affect the therapeutic value of the formulation that observed in the real practical world [7]. The drugs understudies were also classified according to their respective classes based on the computed efficacies and were compared scientifically.

RESULTS AND DISCUSSIONS

The computational studies categorized the formulations understudy according to their pharmacological activities. The computed drug efficacy indices as well as their respective classes of various formulations and products were tabulated (Table 1).

Table 1: The computed Drug Efficacy Indices \(Q(VPK)\) and Classes of various Foot Care formulations.

<table>
<thead>
<tr>
<th>Formulation</th>
<th>(q_{v0})</th>
<th>(q_{p})</th>
<th>(q_{k})</th>
<th>(Q_{VPK})</th>
<th>Pharmacological Category/ Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jivantyadi Yamaka (Classical)</td>
<td>-18.84</td>
<td>-58.73</td>
<td>-22.43</td>
<td>1.00</td>
<td>Vata-Kapha-Pittaghni (Tridoshaghni)</td>
</tr>
<tr>
<td>Jivantyadi Yamaka (Oushadhi Make)</td>
<td>-31.43</td>
<td>-38.19</td>
<td>30.38</td>
<td>0.39</td>
<td>Vata-Pittaghni</td>
</tr>
<tr>
<td>Amrut Malam</td>
<td>-35.12</td>
<td>37.18</td>
<td>-27.70</td>
<td>0.26</td>
<td>Kapha-Vataghni</td>
</tr>
<tr>
<td>Krack Heel Repair</td>
<td>-7.46</td>
<td>-91.86</td>
<td>0.68</td>
<td>0.99</td>
<td>(Kapha)-Vata-Pittaghni (**Tridoshaghni)</td>
</tr>
<tr>
<td>HFC-Cream</td>
<td>19.66</td>
<td>-30.97</td>
<td>-49.37</td>
<td>0.61</td>
<td>Pitta-Kaphaghni</td>
</tr>
<tr>
<td>Herbal Foot Healer</td>
<td>16.01</td>
<td>3.02</td>
<td>-80.79</td>
<td>0.62</td>
<td>Kaphaghni</td>
</tr>
<tr>
<td>Herbal Foot Heal-1</td>
<td>-10.02</td>
<td>-58.78</td>
<td>-31.20</td>
<td>1.00</td>
<td>Vata-Kapha-Pittaghni (Tridoshaghni)</td>
</tr>
<tr>
<td>Herbal Foot Heal-2</td>
<td>-6.04</td>
<td>-85.31</td>
<td>-8.65</td>
<td>1.00</td>
<td>Vata-Kapha-Pittaghni (Tridoshaghni)</td>
</tr>
</tbody>
</table>

The classical fundamental terms and concepts were numerically measured and corresponding efficacies were calculated scientifically for the entire formulations understudy and the respective values were compared. The classical formulation Jivantyadi Yamaka, and designed formulae Herbal Foot Healer-1 and Herbal Foot Healer-2 belong to Tridoshaghni category with highest possible computed Drug Efficacy Index values. The Jivantyadi Yamaka of Oushadhi make became Vata-Pittaghni with a less Drug Efficacy Value 0.39 and much below than the classical one of desired Tridoshaghni nature. The Krack Heel Repair has a less positive \(q_{v0}\) value and hence belong Vata-Pittaghni category that can be considered to an approximate Tridoshaghni category with a Drug Efficacy Value 0.99. The computational studies classified Amrut Malam to Kapha-Vataghni with a computed Drug Efficacy Index value 0.26, Himalaya Foot Care Cream to Pitta-Kaphaghni with a computed Drug Efficacy Index value 0.61 and the prescription Herbal Heel Healer to Kaphaghni with a computed Drug Efficacy Index value 0.62. According to the traditional texts the minor skin disorders belong to vitiation of all the three doshas with a predominantly vitiated one, too or the all three doshas together where one, two or all may predominant. Hence the formulations must be Tridoshaghni category with slight acceptable variations. This is further evident from the computational studies as it classified the classical formulation Jivantyadi Yamaka to Tridoshaghni category. Among the proprietary medicines understudy Krack Heel Repair showed highest value for Drug Efficacy Index value and might be better than the others in its therapeutic effects. The therapeutic values observed clinically also supported the studies for treating the minor skin disorders Vipadika and Vicarcika. The designing of the drugs with Tridoshaghni category is very difficult and the ancient scholars knew it very well and hence the incurability and practical difficulties to cure certain types of skin disorders are explained very well in the respective Samhitas.

CONCLUSION

The study showed that the formulations can be successfully classified to the respective classes/categories based on the computed Drug Efficacy Index values. The combinations must be taken very carefully according to the classical texts. They are very specific and small alterations in their respective ratios could deviate from their Samhita stated therapeutic effects. The computed values can be considered as the direct measure of the efficacies theoretically. The manufactures have to strictly adhere to the formulations as explained in the Sahitas in the best possible manner. The present study also showed that the Computer Aided Drug Designing (CADD) of the Ayurvedic formulations including proprietary formulations based on the classical principles also has high practical importance by showing the incorporation of modern scientific concept like Artificial Intelligence to the field of Ayurveda for Drug Designing processes in a fruitful manner with suitably designed formulations. The success of any prescription is highly based on correct diagnosis and selection of the formulations or drugs. This method also helps the practitioners to classify the modern Ayurvedic proprietary medicines and prescribe them for the Cikitsapurusha based on the Tridosha theory for better clinical results.

CONFLICTS OF INTEREST

No conflicts of interest.

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