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Computation and Comparison of The Drug Efficacy Indices [Q(VPK)] of certain Ayurvedic Cardiac Formulations

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ABSTRACT

Aim: This paper aims to compute and predict the efficacies of certain cardiac formulations based on the traditional Ayurveda philosophy as explained in the basic texts using effective introduction of Artificial Intelligence to this field. Various cardiac formulations not only classical but also proprietary were selected for the studies. The efficacies of these medicines cannot be viewed and calculated on the bases of modern medical technologies and cannot explained on the bases of modern terminologies due to the lack of clinical studies. For the computation of drug efficacies earlier reported computational method developed based on the classical principles was used. Using the developed method efficacies were computed and categorized the formulations under study according to their therapeutic efficiency. The study showed the successful implementation of the reported computational method by computing and comparing the efficacies.

Keywords: Complimentary medicines, Ayurvedic Cardiac Formulations, Drug Efficacy Index [Q(VPK)], Computer Aided Drug Designing (CADD)

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INTRODUCTION

The system of Ayurveda is one of the very old Systems of Alternative Medicines that even practice professionally in the era of modern medicines. The system has its own well established unique philosophy to explain and support the etiology and diagnosis as evident from the *Sutrasthana* of various *samhita* texts. This medical system emphasis mainly on the importance of *Nidana Parivarjana* to maintain health of healthy and eradication of ailments of the sick without causing further discomforts and that also includes psycho-socio philosophical aspects of life as any ancient branches of eastern philosophy. The efficacies of *Ayurveda* formulations are not easy to explain in terms of modern terminologies and cannot be computed accurately based on the modern statistical techniques. The modern science employs many methods to compute and predict the efficacies of various modern drugs and vaccines based on clinical trials and statistical principles. These methods for computing and predicting the efficacies are not advisable as such to the field of *Ayurveda* due to the complicated structures of ingredients of *Ayurvedic* formulations and due to the lack of required proper modern clinical studies. These modern clinical studies are not good for this system as all these formulations are prescribed according to the *Prakrti* of *Cikitsapurusha* the person under medication and *doshic* principles. Further these traditional formulations are more person centered in nature. This paper aims to predict and compute the efficacies of various cardiac formulations including the modern proprietary medicines based on the very principles of Vedic *Ayurveda* and the computed efficacies are compared.

The Heart diseases- *Hrdroga*: According to traditional *Ayurveda* heart diseases are classified under the heading of *Hrdroga*. The narrations of *Hrdroga* and its various treatments are available from many Vedic literatures. According to *Caraka* even the great sages and scholars consider the heart diseases to troublesome and hardly curable. The name *Hrdaya* is derived from three verbal roots that imply the sense of receiving, giving and moving respectively. The *Caraka samhita* points cough, debility, dryness of throat, traction of *kloma*, protraction of tongue, dryness of mouth and throat, epilepsy, insanity, delirium, vacant mind etc. as the common signs of *hrdroga* the heart diseases.

The *Ayurvedic* Etiology of *Hrdroga*: The heart diseases or *Hrdroga* can be classified in to five according to *Ayurvedic* texts viz. *Vataja*, *Pittaja*, *Kaphaja*, *Sannipataja* and *Krimija*. The *Vataja* type heart disease is due to grief, fasting, high physical exercise and intake of rough, dry and little food. Thus the aggravated *Vata* entering the heart produces severe disorders. The symptoms include this type of heart diseases are with characteristic trembling, angina, stiffness, fainting, vacant look, tearing pain and aggravation of pain 'when food is digested'. The etiology of *Pittaja* heart disease is due to hot, sour, salty, alkaline and pungent food, eating during indigestion, wines, anger and the sun vitiate the *Pitta* in the heart. Symptoms of *Pittaja* type heart diseases are characteristic burning sensation in the cardiac region, bitterness in the mouth, bitter and sour eructation, exhaustion, thirst, fainting, giddiness and perspiration. Similarly the etiology of *Kaphaja* type heart disease is attributed to excessive intake, use of heavy and unctuous substances, little mental and physical work and indulgence in sleep. The symptoms of *Kaphaja* type heart disease are found characteristic with drowsiness and anorexia and feeling of numbness, cold and weight in the cardiac region as if it is pressed with a stone. The *Sannipataja* heart diseases show the etiology and symptoms from all the *doshas* together. The fifth type of *hrdroga* termed *Krimija hrdroga* is suffered by the person who is an evil-natured person who takes sesamum, milk, jaggery etc. in the heart disease caused by all 3 doshas, suffers from a gland appearing in a portion of the heart. Moreover, his *rasadhatu* attains moisture due to which organisms develop, spread in the region and lead to decay of the heart. The common and characteristic symptoms of *Krimija Hrdroga* include piercing pain as if the heart is pierced by needles or cut by weapons, itching and intense pain[1]. The diagnosis and classification of heart disorders in *Ayurvedic* terms are to be best performed and the success of the treatments is very much depending on these procedures.

MATERIALS AND METHODS

Here in this paper the Drug Efficacy Indices of a number of successful *Ayurvedic* formulations for

Table 1: The computed Drug Efficacy Indices $Q_{(VPK)}$ and Classes of various Cardiac formulations.

Formulation	$q_{(V)}$	$q_{(P)}$	$q_{(K)}$	$Q_{(VPK)}$	Pharmacological Category/ Class
Hrudroga Gulika-1	-53.85	23.08	-23.08	0.54	Kapha-Vataghni
Hrudroga Gulika-2	-14.50	-47.20	38.30	0.23	Vata-Pittaghni
Rasunatrikatu	0.00	30.43	-69.57	0.39	(Vata)-Kaphaghni
VTH-Pills	34.99	-30.04	-34.97	0.30	Pitta-Kaphaghni
Rudved	36.01	-39.61	-24.38	0.28	Kapha-Pittaghni
WRudved	30.36	-62.00	-7.63	0.39	Kapha-Pittaghni
HRudved	23.90	-29.27	-46.82	0.50	Pitta-Kaphaghni
(Without Bhavana)					
HRudved	-5.36	-64.47	30.18	0.40	Vata-Pittaghni
(With Bhavana)					

Table 2: The computed Drug Efficacy Indices $Q_{(VPK)}$ and Classes of *Trinetra Rasa* with various *anupanas*.

Formulation	$q_{(V)}$	$q_{(P)}$	$q_{(K)}$	$Q_{(VPK)}$	Pharmacological Category/ Class
Trinetra Rasa-1	-44.07	-45.76	10.17	0.80	Vata-Pittaghni
(Without Bhavana)					
ANUPANA					
Madhu (Madya)	-56.02	26.70	-17.28	0.47	Kapha-Vataghni
Madhu (Honey)	6.37	-74.52	19.11	0.49	Pittaghni
Madhu (Milk)	-20.82	-43.49	35.69	0.29	Vata-Pittaghni
Madhu (Water)	-20.82	-43.49	35.69	0.29	Vata- Pittaghni
Madhu(YashtiMadhu)	-20.15	-44.49	35.36	0.29	Vata-Pittaghni
Trinetra Rasa-2	41.23	-44.85	-13.92	0.18	Kapha-Pittaghni
(Parthatvak Bhavana)					
ANUPANA					
Madhu (Madya)	-7.42	-5.56	-87.02	1.00	Pitta-Vata-Kaphagni (Tridoshaghni)
Madhu (Honey)	39.11	-60.37	-0.53	0.22	Kapha-Pittaghni
Madhu (Milk)	16.13	-61.01	22.86	0.22	Pittaghni
Madhu (Water)	16.13	-61.01	22.86	0.22	Pittaghni
Madhu(YashtiMadhu)	17.19	-61.01	21.80	0.22	Pittaghni
Trinetra Rasa-3	35.69	-26.70	-37.61	0.29	Pitta-Kaphaghni
(Partha&Tvak Bhavana)					
ANUPANA					
Madhu (Madya)	-20.75	26.04	-53.21	0.48	Vata-Kaphaghni
Madhu (Honey)	35.52	-53.68	-10.80	0.29	Vata-Pittaghni
Madhu (Milk)	9.12	-68.47	22.41	0.37	Pittaghni
Madhu (Water)	9.12	-68.47	22.41	0.37	Pittaghni
Madhu(YashtiMadhu)	10.76	-68.47	20.77	0.37	Pittaghni

cardiac disorders including proprietary medicines were computed and compared. The formulations understudies were successfully classified to the respective categories in terms of the *dosha* curing nature.

The *Hrdroga gudika*-1 (HG-1): This is a *gudika* preparation as explained in *Caraka Samhita* for treating *Vata* type of heart disorders. It consists of *Hingu*, *Lavana* and *Matulunga* in equal proportions[2]. The Drug Efficacy Index $Q_{(VPK)}$ of this simple classical formulation was computed, classified and compared.

The *Hrdroga gudika*-2 (HG-2): This is a *gudika* preparation as explained by *Acarya Balakrishna* for treating pulmonary tuberculosis[3]. It consists of Pomegranate juice (*Dadima*), *Peepal* powder (*Aswatha*), white cumin seed powder (*Jiraka*), ginger root powder (*Nagara*), cinnamon powder (*Tvak*), Saffron (*Kumkuma*) and old jiggery (*Gudam- Purana*) in specified proportions. The Drug Efficacy Index $Q_{(VPK)}$ of this simple time tested prescription was computed, classified and compared.

The *Rasunatrikatu* (RT): This is a time tested prescription for coronary artery disorders. This simple formulation consists of *Rasuna*, *Nagara*, *Marica* and *Pippali* (*Trikatu*) in equal proportions. The Drug Efficacy Index $Q_{(VPK)}$ of this simple prescription was computed, classified and compared.

The VTH-Pills: This is an *Ayurvedic* proprietary medicine for the treatment of cardiovascular disorders manufactured by ILAJ Herbal Research Remedies, Kerala. The manufacturers claim that this medicine can act as anti atherosclerotic, anti hiperlipidemic, anti paralytic, analgesic and CNS- booster. This medicine contains *Strychnus nuxvomica*, *Syzigium aromaticum* and *Centratherum anthelminticum* as components in fixed proportions. The formulation was clinically studied and certified by the Department of Pharmacology, Kasthurba Medical College, Mangalore[4].

***Rudved*, *Wrudved* and *Hrudved*:** These are modern *Ayurvedic* proprietary medicines for cardiac disorders manufactured by Gajanan Herbaceuticals. The Rudved was introduced in 2005, WRudved in 2008 and HRudved recently in 2014. The manufacturer claim that HRudved is found useful for the treatments of Cardiac insufficiency, Excessive intolerance, Coronary artery diseases, Hypertension, Hyperlipidemia, Angina, Vulvular heart diseases and Hampered left ventricular ejection fraction in addition it is also advisable for saving CABG. The newly introduced HRudved can be considered as an *Ayurvedic* non-invasive remedy for Coronary Artery Disease. These formulations contains *Terminalia arjuna, Apium graveolens, Boerhaavia diffusa, Moringa oleifera, Vitis vinefera, Piper longum, Tinospora cardifolia, Three myrobalons, Tribulus terrestris, Punica granatum, Adhatoda vasika, Cinnamomum cassia, Cyperus rotundus, Commifora mukal, Asphaltum* and *Plumbago* in different combinations ranging from null to a highest of 120mg in addition contains some excepients. The latest formulation introduced namely HRudved is undergone one *bhavana* with *Dalimb ras*[5]. The Drug Efficacy Indices $Q_{(VPK)}$ of these proprietary medicines were computed, classified accordingly and compared.

The *Trinetra Rasa*: This is a classical herbomineral formulation explained in classical texts[6]. The *phalasruti* of this particular formulation claims that it can cure all kinds of heart disorders. This attracted my mind to investigate more deeply in this formulation. The *bhavana* is recommended by *Parthatvak* as per the verses. The usual *bhavana* is done by only *Partha* by taking the meaning of *tvak* as the peel of the *Partha* tree. As the single word *Parthatvak* can be further split into two individual trees as *Partha* and *Tvak* respectively with equal importance and hence I had done the theoretical computation based on the *Bhavana* of equal components also.

Puskaramoolacoorna: This is a classical remedy for *hrdcchoola*. The powder of *Puskaramoola* is advised to have with the *Maksika* (Honey) for relieving the heart pain and related ailments and symptoms[7]. In absence of *Puskaramoola* the *Kustham* is referred as the substituent[8]. The computational studies of these two simple classical drug formulations were also carried out and represented.

EXPERIMENTAL

The respective drug efficacy indices the measures of the pharmacological activities of all the above formulations were computed using the

formula (Figure 1)[9].

Where $Q_{(VPK)}$ is the Drug Efficacy Index, VPK represents *Vata*, *Pitta* and *Kapha* respectively and $q_{(i)}$ is the individual components for the *Tridoshas* and 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. 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 *Hrudved* without any *bhavana* and with *Dalimba rasa bhavana* were also computed. The computed drug efficacy indices as well as their respective classes of various formulations and products understudy were tabulated (Table 1).

Similarly the computation of drug efficacy indices for different possible combinations of *bhavanas* and *anupanas* of *Trinetra Rasa* the classical formulation were recorded and tabulated (Table 2). The various possible *anupanas* were selected as the word *Madhu* have different meanings like *Madya* (Alcohol), Honey, Milk, Water and *Yastimadhu*. The computed Drug Efficacy Indices $Q_{(VPK)}$ and classes of *Puskaramulacoorna* and *Kusthamulacoorna* without and with *Maksika* (Honey) *anupana* were recorded and tabulated (Table 3).

Discussion: 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 different pharmacological classes/categories of various formulations understudy and corresponding computed $Q_{(VPK)}$ values given within brackets are as follows. The formulations *Hrudroga Gulika*-1 (0.23), *Trinetra Rasa*-1 with Milk *anupana* (0.29), *Trinetra Rasa*-1 with water *anupana* (0.29), *Trinetra Rasa*-1 with *YashtiMadhu anupana*(0.29), *Trinetra Rasa*-3 with Honey *anupana* (0.29), *HRudved* with *dalimb rasa Bhavana*(0.40) and *Trinetra Rasa*-1(0.80) belong to *Vata-Pittaghni* category. Among the *Vata-Pittaghni* category formulations *Trinetra Rasa* without *Bhavana* showed highest $Q_{(VPK)}$ value and *Hrdroga Gulika*-1 showed the lowest. The *HRudved* (with *Bhavana*) one of the available formulations in the market showed a moderately high $Q_{(VPK)}$ value. The formulation *Trinetra Rasa*-3 with *Madya anupana* (0.48) belongs to *Vata-Kaphaghni* category. One of the classical formulation *Trinetra Rasa*-2 with *Madya anupana*(1.00) alone belong to *Tridoshaghni* category and *Trinetra Rasa*-2 is the currently marketed formulation by many pharmaceuticals. The formulations *Trinetra Rasa*-3 (0.29), VTH-Pills (0.30), *HRudved* without *Bhavana* (0.50) and *Puskaramoolacoornam* without *Maksika* (0.58) belong to *Pitta-Kaphaghni* category. The formulations *Trinetra Rasa*-2 with *Madhu* (Milk, Water and *Yastimadhu*) with $Q_{(VPK)}$ of 0.22, formulations *Trinetra Rasa*-3 with *Madhu* (Milk, Water and *Yastimadhu*) with $Q_{(VPK)}$ of 0.37 and the formulation *Trinetra Rasa*-1 with *Madhu* (Honey) with $Q_{(VPK)}$ of 0.49 belong to *Pittaghni* category. The formulation *Trinetra Rasa*-1 with *Madhu* (*Madya*) with $Q_{(VPK)}$ of 0.47 and Hrudroga Gulika-2 with $Q_{(VPK)}$ of 0.54 belong to *Kapha-Vataghni* category. The formulations *Trinetra Rasa*-2 (0.18), *Trinetra Rasa*-2 with Honey (0.22), *Rudved* (0.28), *Kusthamulacoornam* with *Maksika* –Honey (0.31), WRudved (0.39) and *Puskaramulacoornam* with *Maksika* –Honey (0.46) belong to *Kapha-Pittaghni* category. The $Q_{(VPK)}$ value of *Trinetra Rasa*-2 the only commercially available classical formulation was found increased from 0.18 to 0.22 when administered with honey. Similarly the classical formulation of *Puskaramulacoornam* with *Maksika* –Honey (0.46) showed the highest $Q_{(VPK)}$ value and found more than that of *Kusthamulacoornam* with *Maksika* –Honey (0.31) that clearly indicates that the importance of *Puskaramula* as the *pradhana dravya*. The formulation *Kusthamulacoornam* without Maksika (Honey) with a $Q_{(VPK)}$ value 0.20 belongs to *Kaphaghni* category. The *Rasunatrikatu* (0.39) belong to (*Vata*)-*Kaphaghni* category that does not increase the *vata* further.

CONCLUSION

The study showed that the formulations can be successfully classified to the respective classes/ categories based on the computed Drug Efficacy Index $Q_{(VPK)}$ values. The computed values can be considered as the direct measure of the

efficacies theoretically. The study also supported that the Computer Aided Designing (CAD) of the *Ayurvedic* drugs and proprietary formulations based on the classical principles in view of modern computational methods are also well applicable with high practical importance. The study showed that the *anupana* might affect and even change the drug category. The study provided the theoretical basis for classifying *abhavadravya* and *pradhanadravya* based on textual references with modern computational results. The success of any prescription is highly based on correct diagnosis and selection of the formulations or drugs. The traditional practitioners were altering the formulations based on the *prakrti*, *dosha* and *dushya* for treating successfully. In addition this new method helps the practitioners to classify the modern *Ayurvedic* proprietary medicines to the respective categories and prescribe them for better clinical results and also helps the researchers to classify and invent more fruitful formulations. When we read the literatures we can found many ambiguities in classifying the modern ailments in terms of *Ayurveda* or in terms of *Tridoshas*. This points the urgent need of more critical and scientific diagnostic method. This paper also supports the feasibility for screening the formulations using computational methods and further based on these interdisciplinary concepts new clinical softwares could be programmed and are presently under primitive stages.

REFERENCES

1. Mamgain P, Singh RH. A Critical Study of the Concept of Ischaemic Heart Disease in Ayurveda. Ancient Science of Life. 1993; 13(1&2):102-110.
2. Jadavji T., editor. *Caraka Samhita*, *Siddhisthanam*, *Trimarmeeya siddhi,* 09/08, 2nd edition, Chowkhamba Krishnadas Academy, Varanasi, 2010; 717.
3. Acharya Balkrishna. Secrets of Indian Herbs for Good Health. 1st ed. Hardwar (Uttarakhand): Divya Prakashan, 2008; 64.
4. Ullal Sheetal D, Rai S, Belagali Y, Gopalakrishna HN, Acharya SD, Akash, et al. Acute oral toxicity of VTH Pills in Wistar rats. Int J Pharm Sci. 2013; 5 suppl 1: 321-323.
5. Hrudved [Homepage on the Internet]. Available from : http://www.hrudved.com
6. Sarvamangala, Shetty VB, Prasanna AS, Ravishankar B, Upadhyaya P. Cardioprotective Activity of Trinetra Rasa in Experimental Animal Model. Int. J. Res. Ayurveda Pharm. 2014; 5(5): 600-604.
7. Mishra B., editor. *Chakradatta*, *Hrudrogacikitsa*, 31/12, Chowkhamba Sanskrit Series, Varanasi, 2008; 272.
8. Mishra B., editor. Tripathi SJ, *Bhavarthasandipani* commentary of *Chakradatta* of *Sri Chakrapanidatta*, *Hrudrogacikitsa*, 31/12, Chowkhamba Sanskrit Series, Varanasi, 2008; 272.
9. Abhilash Mullasseril. The Drug Efficacy Index [$Q_{(VPK)}$] A Novel Parameter To Calculate Theoretically The Efficacy And Efficiency Of *Ayurvedic* Formulations. J. of Bioprocessing and Chemical Engineering 2015; 3(1): 1-5. homepage: http://scienceq.org/Journals/JBCE.php

Figure 1: Equation for computing Drug Efficacy Index $Q_{(VPK)}$

$$Q_{(VPK)} = \frac{\left|\sum_{(V,P,K)} q_{(i)}\right|}{100} + \prod \leq 1$$

Table 3: The computed Drug Efficacy Indices $Q_{(VPK)}$ and Classes of Puskaramulacoorna and Kusthamulacoorna without and with Maksika (Honey) anupana.

Formulation	$q_{(V)}$	$q_{(P)}$	$q_{(K)}$	$Q_{(VPK)}$	Pharmacological Category/ Class
Puskaramulacoornam	20.83	-16.67	-62.50	0.58	Pitta-Kaphaghni
Kusthamulacoornam	20.00	20.00	-60.00	0.20	Kaphaghni
With Anupana Maksika (Honey)					
Puskaramulacoornam	26.83	-46.34	-26.83	0.46	Kapha-Pittaghni
Kusthamulacoornam	34.38	-31.25	-34.38	0.31	Pitta-Kaphaghni or Kapha-Pittaghni