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A pharmacokinetic profile of Shankhpushpi (Convolvulus pluricaulis): From experimental studies

Ruchi Sharma[1], Rohit Sharma[1]

Department of Rasa Shastra and BhaishajyaKalpana, Faculty of Ayurveda, Institute of Medical Sciences, BHU, Varanasi, Uttar Pradesh 221005, India,

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ABSTRACT
In the Charak Samhita, the neuromodulatory and rejuvenating properties of Shankhpushpi (Convolvulus pluricaulis) are extensively discussed within the Medhya Rasayana category. The standardisation and pharmacokinetic profile of biomarkers in herbs have been ongoing issues in recent years. Therefore, pharmacokinetics of the Ayurvedic formulations are urgently needed in order to maintain position. Pharmacokinetics is one of the legal requirements for investigational new drug approval, which deals with the absorption, distribution, metabolism, and excretion of the biomarkers or the new drug entity. So, in this study we will extensively reviewed pharmacokinetic profile of Shankhpushpi by searching various databases. Results of review indicate that only insilico study is available on its pharmacokinetic reports. Raising the need towards exploring this formulation in various invivo, invitro and clinical models.

Keywords: Shankhpushpi, Convolvulus pluricaulis, pharmacokinetic profile, Ayurveda, neurological disease

I. INTRODUCTION

Ayurveda is the most ancient system of traditional medicine been practicing in India.The neurological disease spectrum is the greatest threat to public health, including several types of dementia, traumatic brain injuries, age-related and genetic neurodegenerative disorders encompassing more than 600 disease conditions [1,2]. These diseases contribute to the high mortality and disability during a lifetime. According to the world health organization (WHO), neurological disorder contributes to 6% of the global burden of disease [3], and in India absolute number of deaths and DALYs commencing from all neurological disorders combined increased deaths by 39%, and DALYs by 15% [4]. The burden of neurological disorders has grown and is likely to increase further due to the increased lifespan and population growth. Therefore, there is a clear need to manage and treat these disorders better.

Furthermore, current therapeutics for improving neurological care are not cost-effective and have many limitations [5]. Currently, herbal products are perceived to represent safety, as opposed to synthetic drugs that are considered unsafe for humans and the environment [6]. Several side effects are reported for modern psychotropic medications employed to treat neurological disorders[7]. Ayurveda lists several herbs and their multidimensional utility in various neurological conditions. The neuromodulatory and rejuvenating role of Shankhpushpi(Convolvulus pluricaulis) is extensively mentioned under MedhyaRasayanacategory in Charak Samhita, Chikitsasthana, third pada, Verses 30-31. AcharyaCharaka mentioned the recipe of the abovementioned plant: paste of C. pluricaulis as neuromodulating and rejuvenating therapies.

Recent times have been facing constant challenges like standardization and pharmacokinetic profile of biomarkers in the herbs. Thus there is an urgent need of pharmacokinetics of the Ayurvedic formulations in order to achieve the uphold position. Pharmacokinetics which deals with the absorption, distribution, metabolism and excretion of the biomarkers or the new drug entity is the one of the regulatory requirement for an investigational new drug approval. Bioactive guided pharmacokinetic approach method is needed for Ayurvedic system of medicine to determine the pharmacokinetics of relevant markers in the formulation having number of markers.

So, in this study, we will conduct a comprehensive review on the available information

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related to pharmacokinetic profiles of Shankhpushpi.

II. METHODOLOGY

A number of widely used databases, including SciFinder, Google Scholar, MEDLINE, EMBASE, Scopus, PubMed, and Science Direct, were utilised to retrieve published papers (up until April 2023). We looked for and extracted published literature relating to pharmacokinetic reports of Shankhpushpi for its neuroprotective effects using the keywords "Shankhpushpi", "neuroprotective", "nootropic", "absorption", "metabolism", "distribution", "excretion", "pharmacokinetic profile", and "mechanism of action". The language of searches was limited to English.

III. PHARMACOKINETIC PROFILE

It is a difficult task to research the pharmacokinetic characteristics of these herbs as it contains a cocktail of compounds [8]. After looking through the various databases, it was discovered that no single pharmacokinetic report conducted on invitro and invivo models was available [9]. The key challenge in studying memory enhancement activity is the identification and mapping of associated targets and genes, which, when perturbed, results in long term potentiation or long term synaptic plasticity and retrieval. For studying complex models such as these, A multi-target multi-gene computational approach is necessary.Considering that it operates on the multi-target, multi-gene concept, a computational method is required. Network pharmacology, a new field in computational systems biology that can make easier to analyse complicated systems with several chemicals, targets, and gene aspects. Redundancy, pleiotropy, connectedness, network analysis, and systems biology are all used by network pharmacology to make it easier to understand complicated biological systems. The comprehension of the system from multiple viewpoints (pathway analysis, diseaseome analysis, Gene ontology (co-expression, physical interaction, co-dependency, etc.)) is also improved by enriching the created networks [10].

Only one study has been reported which had established the pharmacological network of the Shankhpushpi herbs in the human model.In order to comprehend the memory-improving properties of Shankhpushpi, a network pharmacology integrated pharmacokinetics technique was used in this study. Data mining and drug-likeness screening were used to identify the chemical space of Shankhpushpi (oral bioavailability (OB) 0.5, Blood-Brain Barrier, and Gastro Intestinal permeability). Target identification of the screened chemical space was then carried out using constraint-based database prediction (similarity parameter 0.85). A protein-protein (P-P) interaction network of the identified Shankhpushpi nootropic targets was built, annotated, and analysed using Genemania. Additionally, DAVID (FDR 0.02) and Genemania (FDR 0.02) were used to do a comparative gene ontology and enrichment analysis of the (P-P) network under constraints ($P \leq 0.05$).

The disorders connected to the discovered Shankhpushpi nootropic targets were found by searching the KEGG and DisGeNet databases, and a gene-disease network was created. Finally, the results of the statistical network analysis showed that the key processes through which Shankhpushpi exercised its nootropic action were dopaminergic activity, 5-hydroxytryptamine activity, mitogen-activated protein kinase cascade activity, and histone deacetylase activity [11]

IV. CONCLUSION

Result of extensive review indicate that complete pharmacokinetic profile of Shankhpushpi is not generated till now. No invivo, invitroand clinical study is available in any databases but a insilico study was found. Findings show the possible leads to which drug interact. Further studies should be conducted to validate the result.

V. FUTURE PROSPECTIVE

Pharmacokinetic research will be useful in identifying differences between Ayurveda therapies with similar chemical makeup and in discovering the action, organ involved, safety investigations, dose determination, and ADME of AYUSH medicines.Study of pharmacokinetics can be done by measuring plasma concenteration, clearance rate, heamatological, and biochemical parameters on 0 h 30 min, 1hr, 3hr, 6hr, 9 r,12hr, 24hr, 48hr, 7day, 14day, mortality, and histopathology and also interaction with CYP450 in various invivo, invitro and clinical models. These pharmacokinetics studies help generate data related to its complete action in the body. Also, the lead present from insilico study can be validated in further clinical and animals models.

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