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Pharmacodynamics of *Nasya-Karma*: A Review

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ABSTRACT

Nasya Karma is one among five procedures of *Panchakarma*, in which processed medicines is delivered through nasal route, either in the form of *Ghee*, oil, powder, liquid or smoke. It is particularly indicated in the treatment of *Urdhavajatrugata Rogas* (diseases occurring in the organs situated in *Shira Pradesha*/above the clavicle) but it works on the diseases of whole body by improving the activity of the different glands and nervous system. According to *Ayurvedic* classics *Nasa* is the entrance (doorway) of *Shira Pradesha* which means that it might be connected pharmacodynamically through neurovascular system i.e. blood vessels & nervous system (olfactory nerves). The *Nasya Dravya* which is administered in nostrils reaches to the *Shira* and eliminates the vitiated *Doshas*, which are responsible for producing disorders. Pharmacodynamics of the *Nasya Karma* can be understood through various mechanisms related to anatomical and physiological studies i.e. absorption mechanism, vascular pathway, lymphatic pathway & neural pathway.

KEYWORDS

Nasya Karma, Doorway, Pharmacodynamics, Shira, Panchakarma.



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INTRODUCTION

Nasa (nose) is the organ of smell, which is included one among the *Panchagyanendriya*, and its functions are not limited to respiration and olfaction, but also act as a good pathway for medicinal administration. *Nasya Karma* is a specific therapeutic procedure of *Panchakarma*, where the drug is instilled through nostrils (gate way of brain). The role of *Nasya Karma* is not limited to *Shirovirechana* i.e. elimination of morbid *Doshas* and as *Shamana*, controlling the *Doshas* but also plays vital role in nourishing the *Panchagyanendriya Adhithana* located in *Shira*. In *Ayurveda Shira* has been given prime importance, and considered it as one of the principle vital organ of the body, where *Prana* (i.e. life) stand and site for all *Indriyas* (sense organs), hence known as *Uttamanga*¹. The channels which are carrying the sensory and motor impulses from the *Shira* are like the rays from the Sun, that reaches all over the body².

Whenever processed drugs are introduced in nostrils, where they travels the entire passage and reaches to the porous cribriform plate, and from there it gets absorbed and reaches to tissues of the brain. In our daily life due to some medicines like pain killers/antibiotics/oral-

contraceptives/steroids, and due to tobacco, alcohol, irregular food habits, sleeping disturbance, suppression, mental stresses, depression, night awaking, day sleeping & other life style related factors, mankind get *Shirogata Rogas* and suffered from many terrible disorders. Hence, it is the need of time to know about *Nasya* procedure in *Panchakarma* & its importance by which a common man gets healthy life without having any disease³. In Pharmacodynamics of *Nasya Karma*, first step is mucosal absorption mechanism, after getting absorbed into the mucosa the drug may take the vascular or the neural or lymphatic pathway to show its action on body or on diseases.

LITERATURE REVIEW

Our classical texts have been vividly elaborate various types of *Nasya* according to different aspects whereas according to functions there are three types of *Nasya*⁴ i.e.

1. ***Virechana Nasya (Cleansing Nasya)***:It denotes elimination of vitiated *Doshas* from *Shira Pradesh*. After administration of *Nasya Dravya*, it enters into the *Shirah Pradesh* and eradicates exclusively the morbid matter, as nasal discharge, tear & salivation. Mainly used to treat *Kaphaja* diseases.
2. ***Snehana/Brihmana Nasya (Nutrition Nasya)***:It imparts strength to



neck, shoulder and chest. Mainly given in *Vataja* disorders.

3. **Shamana Nasya (Palliative Nasya):** Used for the alleviation of *Doshas* situated in *Shirah*. *Shamana Nasya* is used according to *Doshas* which is aggravated in the body. It is mainly administered to treat *Pittaja* and *Raktaja* disorders.

The clear description regarding the pharmacodynamics of *Nasya Karma* is not available in *Ayurvedic* classics. According to *Acharya Charaka*, *Nasa* is the doorway of *Shirah*. The processed drug introduced through nose as *Nasya Dravya*, transports to the brain and removes morbid *Doshas*, which are producing the disease⁵. In *Astanga Samgraha* it is explained that *Nasa* being the gateway to *Shira*, the processed drug which instilled into the nostrils, transports to the *Shringataka Marma* by *Nasa Srotas* and spreads in the *Murdha Pradesh* (brain) taking root of *Netra* (eye), *Shrotra* (ear), *Kantha* (throat), *Siramukhas* (opening of the vessels) etc. and eradicates the morbid *Doshas* in supraclavicular region and eliminates them from the *Uttamanga*⁶. *Acharya Sushruta* has explained *Shringataka Marma* as a *Sira Marma* which is the union of *Siras* (blood vessels), are supplying to nose, ear, eye and tongue. It has been further pointed out that harmful impact on *Shringataka Marma* results in sudden death⁷. Commentator Indu

of *Astanga Samgraha* opined *Shringataka Marma* as the inner side of middle part of the head i.e. “*Shiraso-Antarmaddhyam* .” Under the complications of *Nasya Karma*, *Acharya Sushruta* noted that the excessive *Virechana*(eliminative)*Nasya* may cause *Mastulunga* (CSF) to flow out to the nose⁸.

MATERIALS AND METHODS

To explore the concept of *Ayurveda* and contemporary science concerning Pharmacodynamics of *Nasya Karma*, hence all materials are collected from *Ayurvedic* literature and commentaries, related supportive literatures & full texts articles and compiled for better understanding the mode of action of therapeutic *Nasya Karma*.

DISCUSSION

Mode of action of *Nasya-Karma*: The medicines which are put into the nostril moves up to the *Shringataka Marma* and spreads to the interior of the head and the junctions where all the channels related to eye, ear and nose are situated together. The olfactory nerves are connected with limbic system which consist of amygdaloidal complex, hypothalamus and basal ganglia etc. (i.e. higher centres of brain), thus medicines which are administered to nostrils are transported to higher centres of



the brain and acts on nervous and endocrine system through regulating morbid *Doshas*.

We can understand the mode of action of therapeutic *Nasya* procedure as: after the instillation of *Nasya Dravya* in nostrils, the lipid soluble substances diffuses through plasma membrane of nasal mucosa due to greater affinity of passive absorption and reaches to olfactory receptor cells & transports through olfactory nerve to olfactory bulb & olfactory tract and finally reaches to *Shringataka Marma* (main vital point situated on the surface of the brain corresponding to the nerve centres) and stimulates the nerve endings & transmitted to the central nervous system, which results scraping of morbid *Doshas* of head and extracts them out, leads to normalises the *Tridoshas*.

In the Pharmacodynamics of *Nasya Karma*, *Nasya Dravya* absorption by nasal mucosa is the first step. After getting absorbed into the mucosa the drug may take the vascular path or the neural path or lymphatic path to show its action, as explained:

Mechanism of Drug Absorption, given through Nasal route: The first step in transportation of drug through the mucus membrane of nasal cavity. The uncharged and large particles may find it more difficult to cross. Therefore several mechanisms have been proposed but the following two

mechanisms have been considered predominantly:

The first mechanism of absorption denotes an aqueous route of transport i.e. Paracellular route. This is a slow and passive route & there is an inverse log correlation between the molecular weight of water soluble compounds and intranasal absorption. Drugs with a molecular weight >1000 Daltons shows poor bioavailability.

The second mechanism denotes a lipoidal route i.e. transcellular route. The lipophilic drugs that show a rate dependency on their lipophilicity, are transported through this route. In this mechanism substances are transported by an active transport route via carrier mediated means or passage by the opening of tight junctions⁹.

Factors Influencing Nasal Drug Absorption:

- (1) Nasal physiological factors like blood flow, mucociliary clearance, enzymatic degradation, transporters and efflux systems.
- (2) Physical and chemical properties of drugs like molecular weight, lipophilicity, pKa, stability, solubility.
- (3) Formulation factors like pH, volume, concentration and viscosity of the formulation.
- (4) Effect of drug administration methods like keeping the head in lowered position and retention of medicine in



nasopharynx help in providing sufficient time for local drug absorption. Any liquid soluble substance has greater chance for passive absorption directly through the cell of lining membrane. On other hand, local *Abhayanga* and local *Swedana* also enhance the drug absorption.

Mechanism of Transportation of Drug, after Absorption: Intranasal route of drug administration is of great significance, as it is less time taking & easily applicable procedure and provide effective transportation of medications directly into CNS. There are three mechanisms for the nose-to-brain drug delivery; in which one is intracellular transport mediated route and two are extracellular transport mediated routes:

- (1) Intracellular transport: Comparatively slow process, by which substances are taking hours for transport to the olfactory bulb. The olfactory nerve could uptake the molecules by such processes as endocytosis, which could pass to the olfactory bulb through axonal transport.
- (2) Extracellular transport: There are two extracellular transport route, where they have been fast transportation of substances, which can occur within minutes of drug administration. In the **first** route, at first, substances could pass the gap between the olfactory nerves in the olfactory epithelium and consequently reached to the

olfactory bulb. And in the **second** route, substances may be passed along the trigeminal nerve to bypass the blood brain barrier. After reaching the olfactory bulb or trigeminal region, by diffusion process substances may pass into the region of brain, which may also forwarded by “perivascular pump” which is possessed by arterial pulsation. In addition intranasally introduced medications may also partly move to the CNS after the medications entered into the systemic circulation from the nose¹⁰.

The later course of Drug Transversion can occur in these Ways:

- (i) By systemic Circulation (ii) By Neural pathway (iii) By Direct pooling into the intracranial region, which can be assumed by two paths, viz. (a) By Vascular path (b) By Lymphatic path.
- (ii) **By Systemic Circulation:** Surface area of the nasal cavity is about 160 cm². However, the olfactory region is about 5 cm²; there are six arterial branches which supply the nasal cavity, making it a very suitable route for drug administration. The blood flowing in this region is get slightly more reabsorbed in the nasal vein, with an excess draining into the lymph vessels, making this region a very suitable route for medications delivery¹¹. Nasal drugs absorption is influenced by blood flow rate, as it increases the amount of drug that



transports from the membrane, hence arriving the general circulation¹².

(iii) By Neural pathway: Olfactory epithelium is located in the upper nasal cavity and contains olfactory cells which transverse the cribriform plate and extend up into the cranial cavity. When substances came in contact with mucosa, they are rapidly transported, passover blood brain barrier and rapidly achieving CSF level. Major divisions of olfactory tract leads directly to a portion of the amygdale known as corticomedial nuclei, that lie immediately beneath the cortex in the pyriform area of the temporal lobe. The olfactory nerve has close relation with the brain and connected with the limbic system. However, the drug administrated here, stimulates the higher centres of brain and shows action on regulation of endocrine and nervous system activity¹³.

(iii) By direct pooling into the intracranial region:

(a) Vascular Path transportation through the pooling of nasal venous blood to the facial vein, just of the opposite entrance the inferior ophthalmic veins also pool into the facial vein, both facial and ophthalmic veins have no valves in between. So that, blood may drain on either side, that is to say the blood from facial vein can enter in cavernous sinus, in reverse direction. So that, pooling of blood from nasal veins to

venous sinuses is more likely in the head lowered position due to gravity. On these lines, the absorption of substances into meninges and related parts of intracranial organs, is a worth considering point. Moreover, the modern scholars have noted that the infective thrombosis of the facial vein may lead to infection of the meninges easily through this path.

(b) Lymphatic path, drug transportation by this pathway, can reach direct into the CSF as it is known that the arachnoid matter sleeve is extended to the nasal submucosal area along with olfactory nerve. Experiments have shown that the dye injected to arachnoid matter has caused coloration of nasal mucosa within seconds and vice versa also¹⁴.

According to the above discussion, we could be say that the procedures, postures & conducts explained for *Nasya Karma* are of vital importance in drug absorption & transportation. The facts discussed here are also convincing us about the definite effect of therapeutic *Nasya* procedure on the neuro-vascular function, neuro-endocrine level and neuro-psychological levels are as follows:

Effect on Neuro-Vascular Function: The head lowering position (and elevation of lower limbs) and fomentation of face; these procedures seem to have an impact on the blood circulation of head. By fomentation



the efferent vasodilator nerves on the superficial surface of the face are stimulated and increasing blood flow to the brain i.e. momentary hyperaemia. This causes extra perfusion of blood in the brain. From these evidences it can be stated that the modus operandi of *Nasya Karma* has a definite impact on central neurovascular system & likely to decrease the blood brain barrier to enable certain drug absorption in the brain tissues¹⁴.

Effect on Neuro-Endocrine level: The peripheral olfactory nerves are chemoreceptor in nature. There are adjacent nerves called as terminal nerves which run along the olfactory nerves. These nerves are connected with limbic system of the brain including hypothalamus¹⁵. Moreover, hypothalamus is considered to be responsible for integrating the functions of endocrine & the nervous system. The stimulation of olfactory nerves, caused stimulation in certain cells of hypothalamus and amygdaloid complex, but the nature of the effects is not properly understood. It is understood that just like primitive mammals, man also responds to the language of smell in the environment¹⁶.

Effect on Neuro-Psychological levels: The Limbic system is also concerned with behavioural aspects, it also has control over endocrine secretions. Thus, certain medications delivered through nasal route

may have an impact on immediate Psychological functions by acting on limbic system through olfactory nerves¹⁶.

CONCLUSION

Nose is the entrance of head, and the systematically performed therapeutic *Nasya* procedure, have been important role in curing and preventing a number of disorders pertaining to the head. *Nasya Karma* is improving the neurovascular, endocrinal and psychological functions by scraping out, as well as balancing the morbid *Doshas* of the head. So the pharmacodynamics of therapeutic *Nasya Karma* is easily concluded as per classics and modern scientific parlance, through absorption mechanism, transportation after absorption and then it's effect on different systemic activity and on the disease.



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