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The Effect of *Arishta Dhoopana Yoga* as Fumigation Agent on *Klebsiella pneumoniae*

Author: Shravani R. Babar¹

Co Authors: Ramchandra P. Babar²

¹Department of Swasthviritta, Sumatibhai Shah Ayurved Mahavidyalaya, Malwadi, Hadapsar, Pune, MS, India

²Department of Kaumarbhritya, Sumatibhai Shah Ayurved Mahavidyalaya, Malwadi, Hadapsar, Pune, MS, India

ABSTRACT

Hospital Acquired Infection (HAI) are occurring commonly because of lack of cleaning or lack of effective disinfectant that can kill all the micro-organisms which spread through hospital environment. *K. Pneumoniae* is very commonly found organisms in hospital environment and can be spread through person to person. *Arishta Dhoopana Yoga* is a *Dhoopana yoga* described by Acharya *Kashyapa* in *Kashyap samhita dhoopkalpadhya* to kill *Rakshasa (Krumi, microorganisms)*, it is a herbal preparation of *Nimba*, with antimicrobial effect, easy for preparation, cost effective *dhoopana yoga* (fumigation agent). *Arishta Dhoopan Yoga* fumigation showed significant antimicrobial activity as good as formalin fumigation. Herbal fumigation (*Arishta Dhoopan Yoga*) is best possible and cost effective infection control measure for some specific microorganism (*K. Pneumoniae*). Herbal fumigation (*Arishta Dhoopan Yoga*) has no hazardous effects on human body. So, this Herbal fumigation (*Arishta Dhoopan Yoga*) can be considered for routine hospital fumigations. Fumigation effect of *Arishta Dhoopan Yoga* and Formalin were compared on *K. pneumoniae*. (Prepared in the form of agar slant) sprayed glass experimental chambers of 1M³. The colony forming units (CFUs) of *K. pneumoniae* by taking swabs for the culture, before fumigation (at 0 Minute) and after fumigation (at 30 minutes, 3 Hours) were recorded. The observations of each group and intra group were compared. Significant results were noted in CFUs after fumigation in each group. *Arishta Dhoopan Yoga* showed significant effect after fumigation.

Key Words *Fumigation, Herbal Fumigation, Dhoopan, Arishta Dhoopan, Ayurveda & Fumigation*

INTRODUCTION

Fumigation means exposure to disinfectant fumes. Fumigation is a method of pest control that completely fills an area with gaseous fumigants to suffocate or poison the pests within. Sterilization destroys all micro organisms including spores on the surface of an article/item or fluid, to prevent pathogen transmission associated with the use of that item/article. A number of procedures are

followed for sterilization of delicate, heat, labile equipment. The centre of disease control defines healthcare associated infection or hospital acquired infections (HAI's) that patient acquires during the course of receiving treatment for other conditions or health care workers acquire while performing their duties within hospital. Sterilization is a validated process, which is used



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to render a product free of all forms of viable microorganisms including bacterial spores³.

The chemical and physical characteristics qualify formaldehyde as most suitable agent for disinfection, but from many previous studies it is observed that the use of chemicals above the certain limits is hazardous to human lives. Formalin and other fumigation agents may cause – skin rashes, eye irritation & having unpleasant odour & cancerous effect¹. *K. pneumoniae* is a gram negative bacterium, anaerobic, non-motile, encapsulated, rod shaped bacteria, commonly found in the gastrointestinal tract and hands of hospital personnel. In 1928 study found that airborne micro-organisms could be killed using mists of dilute bleach, disinfectant must be dispersed either as an aerosol or vapour at sufficient concentration in air to cause the number of viable infectious micro-organisms to be significantly reduced.

In this era of emergence of multi drug resistant organism & decrease in newer antibiotics the ancient healing method by using traditional medicine can be considered very effective.¹¹The Ancient scholar of *Ayurveda* explain the *Dhoopana kalpana* for the fumigation of *vranitagar*, *sutikagar*, *kumaragar*. In *Kashyap samhita vrudha jivaka* has explained 40 *dhoopana yoga* for fumigation, among those only 32 *Dhoopana yogas* are seen in the present manuscript and only 30 of them are in complete verse. According to Acharya *Kashyapa* these 2 drugs (*Arishta* & *Ghritha*) are sufficient enough for *Dhoopana karma* i.e. *Raksha karma*. This explains the potency of *Ghritha* and

Nimba as one of the best *Rakshoghana dravyas* (disinfective agent).²

AIM

Compare the effectiveness of already known sterilizing agent formalin and *Arishta Dhoopana Yoga* for fumigation on *K. pneumoniae*.

OBJECTIVES

- To evaluate the efficacy of *Arishta Dhoopana Yoga* for fumigation on *K. pneumoniae*.
- To calculate the quantity of *Arishta Dhoopana yoga* & time required for fumigation in 1 cubic meter of experimental chamber.
- To develop a standard protocol for *Arishta Dhoopana Yoga* for fumigation as an alternative.

MATERIALS

1. Neem panchang powder:^{4,5}

Kula: *Nimbakula*

Family: Meliaceae

Latin name: *Azadirachta indica* A. Juss (*Melia azadirachta* Linn.)

Chemical Composition:

Triterpenoids, limonoids, azadirachtin, azadiradione, nimbin, nimbolide, nimbidin, nimbinin, sitosterol, margosinolide, tocopherol, salannol, Sterols, margosine, volatile oils, astringent elements, gum, sugar, white secretion and traces of sulphur.

Properties:

Guna- Laghu., **Rasa-** Tikta, **Kashaya,** **Vipaka-** Katu, **Virya-** Sheeta **Dosha-** KaphaPittashamak



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Karma- *Krumighna, Kusthagna, Kandughna, Vishaghna, Vranaghna, etc.*

Parts used- Panchanga (Flowers, leaves, bark, seeds and oil).

2. Two experimental chambers of 1 meter cube made up of glass were constructed,

3. *K. Pneumoniae* (non-pathogenic organisms) in agar slant form.

METHODS

- It is an experimental study conducted in one meter cube experimental chamber made up of glass.
- Non-pathogenic *K. pneumoniae* organism is prepared in the form of agar slant for fumigation with standard method.
- Firstly cleaning of trial and control experimental chambers was done.
- Each ingredient of *Arishta Dhoopana Yoga* was taken in equal quantity.⁶

OBSERVATIONS

- Standardization and authentication of *Arishta Dhoopana Yoga* was done from authentic source; which was found standard. Preparation of *Arishta Dhoopana Yoga* was done with standard operating procedure guidelines.
- Then the spraying of *K. Pneumoniae* organism in both experimental chambers was done and pre fumigation swabs were taken from each experimental chambers walls and air.
- Fumigation with '*Arishta Dhoopana Yoga*' in trial experimental chamber and formalin in control experimental chamber was performed.
- Post fumigation swabs were taken after 30 minutes and 3 hours from both experimental chambers. Swabs were taken from roof, floor, wall and air.
- Swabs sent to microbiology lab for testing; the observations were recorded, analysed and compared accordingly

Table 1 Trial Experimental Chamber Observation

	Pre-fumigation (0min)					Post-fumigation (30min)					Post-fumigation (3hrs)				
	1cfu	2cfu	3cfu	4cfu	5cfu	1cfu	2cfu	3cfu	4cfu	5cfu	1cfu	2cfu	3cfu	4cfu	5cfu
Date	8oct 2016	10oct 2016	11oct 2016	12oct 2016	13oct 2016	8oct 2016	10oct 2016	11oct 2016	12oct 2016	13oct 2016	8oct 2016	10oct 2016	11oct 2016	12oct 2016	13oct 2016
Roof	89	104	90	84	105	71	60	71	45	73	42	29	38	31	49
floor	89	108	96	116	132	65	94	76	92	102	32	67	56	68	78
Wall	178	154	123	186	143	119	104	94	132	87	74	52	65	75	46
Air	145	102	114	108	135	97	79	83	73	89	56	43	37	65	58

Table 2 Control Experimental Chamber Observation

	Pre-fumigation (0min)					Post-fumigation (30min)					Post-fumigation (3hrs)				
	1cfu	2cfu	3cfu	4cfu	5cfu	1cfu	2cfu	3cfu	4cfu	5cfu	1cfu	2cfu	3cfu	4cfu	5cfu
Date	8oct 2016	10oct 2016	11oct 2016	12oct 2016	13oct 2016	8oct 2016	10oct 2016	11oct 2016	12oct 2016	13oct 2016	8oct 2016	10oct 2016	11oct 2016	12oct 2016	13oct 2016
Roof	136	129	154	138	120	109	98	121	89	94	86	76	72	65	60
floor	124	137	149	153	138	102	119	120	101	98	89	95	90	85	76
Wall	120	133	128	144	156	97	111	108	99	94	82	89	70	79	69



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Air 132 119 147 130 153 104 98 121 110 120 87 76 97 89 98

Table 3 Effect of Trial and Control Group after Fumigation on Klebsiella pneumoniae

Klebsiella pneumoniae	Mean		t-Value	P-Value	Result
	Before	After			
Trial Group	120.1	53.1	13.142	0.000	Significant
Control Group	137.0	81.5	17.295	0.000	Significant

Paired t-test used to test the effect of Trial Group and Control Group, with their respective quantitative observations. P-Value of Trial Group and Control Group are less than 0.05 hence it is concluded that effect observed in both groups are significant Figure 1.

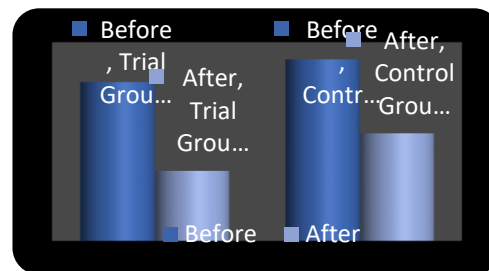


Figure 1 Effect on Trial Group and Control Group

Table 4 Comparison between Trial Group and Control Group

Group	N	Mean Diff	SD	SE	t-Value	P-Value
Trial Group	20	67.0	22.80	5.10	1.909	0.064
Control Group	20	55.5	14.35	3.21		

Chart 1 Percentage changes before and after fumigation

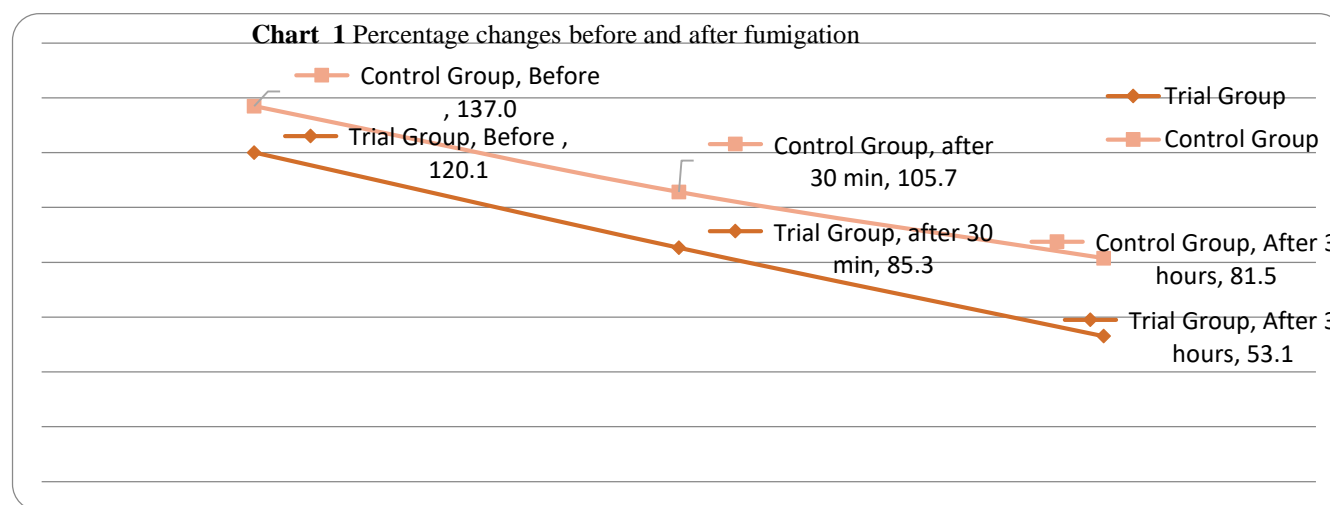


Chart 1 Percentage changes before and after fumigation

Unpaired t-test has been applied for the comparison of the effects between the groups. From above table we can observe that P-Value is greater than 0.05 hence it is concluded that there is no significant difference between effect of trial group and control group.

the percentile reduction before and after fumigation in Trial and Control group are 55.8 and 40.5, respectively. The effect of *Arishta Dhoopana Yoga* on K. Pneumoniae colonies reduction is effective after 30 minute but more effect observed after 3hours.

RESULTS

Comparing the effect of *Arishta Dhoopana Yoga* and formalin for fumigation on K. Pneumoniae,

DISCUSSION

Disinfection is the basic and important requirement for the hospital or at any places, but
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in the hospital, person is in direct contact with the infectious agents. Today we are using various types of chemical disinfectants which causes harmful effect on human body like, itching, rashes over skin, burning of eyes, also they are carcinogenic.¹ In *Ayurveda Acharya Kashyapa* explains the various *dhoopan kalpa* to kill the *krumi*, *rakshasas* (microorganisms). Neem (*Azadirachta indica*), itself shows an antibacterial activity, which was already proved. Neem (*Azadirachta indica*) shows antimicrobial role through inhibitory effect on microbial growth/potentiality of cell wall breakdown. Azadirachtin a complex tetranortriterpenoid limonoid present in seeds is the key constituent responsible for both anti feedant and toxic effects in insect. Results suggest that ethanol extract of *Neem* leaves shows in vitro antibacterial activity.⁹

The extract of *Neem* when used as a medicinal plant could be useful for the growth inhibition of the carcinogenic bacterium *S. subrinus* (Md mohashine bhuiyan et al, 1997). The phyto-constituents alkaloids, glycosides, flavanods & saponines are antibiotic and antimicrobial principles of plants. The antibiotic and antimicrobial principle are actually the defensive mechanism of plant against different pathogens (Hafiza, 2000), the result (table 1) was also supported by¹⁰.

The *Neem* oil is also showing antimicrobial effect, an important characteristic of essential oil & their components, is their hydrophobicity. Which enable them to partition the lipid of the bacterial cell membrane & mitochondria, disturbing the cell

structure & rendering them more permeable causing as described in (~~Knobloch et al, 1986~~) extensive leakage from bacterial cell or the exit of critical molecule & ion may lead to death, this may be the reason of higher inhibition rate of oil¹¹.

In this study *Arishta Dhoopana Yoga* (*Panchanga powder*) is used, which has proven antimicrobial property, this *dhoopana* drug was burned along with *Goghrit*; which produces natural fumes. It heals the respiratory system infections, clears blood clot, bacterium affecting the nasal mucosa, lungs & veins⁵. The outcome of this study (table 1, 3) is that the *Arishta Dhoopana Yoga* proved its antimicrobial activity; so it can be used as an alternative for fumigation in hospital wards/operation theatre; as other chemical agents of fumigation are having many hazardous effects on human body⁷. The *Arishta Dhoop* (fumigation with *Neem panchanga* and ghee) is an easily available drug, also cost effective, minimum instruments are necessary for *dhoopana*, no any expert person required it can be done by all the people. *Neem* oil exhibits more than 99% inhibition rate against the bacterial strains¹¹.

The *K. pneumoniae* is selected for the study because it is the one of the common microorganisms that occurs in hospital environment, easy availability of cultures, rapid ability to grow colonies, required same nutrient both for culturing and minimal incubation period.

CONCLUSION



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Arishta Dhoopana Yoga is moderately efficient antimicrobial fumigant against the micro-organism *K. pneumoniae*. The quantity of *Arishta Dhoopana Yoga* required for fumigation of experimental chamber of one meter cube is 40gm. The percentile reduction of pre fumigation and post fumigation of trial experimental chamber (*K. pneumoniae*) was significant.



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